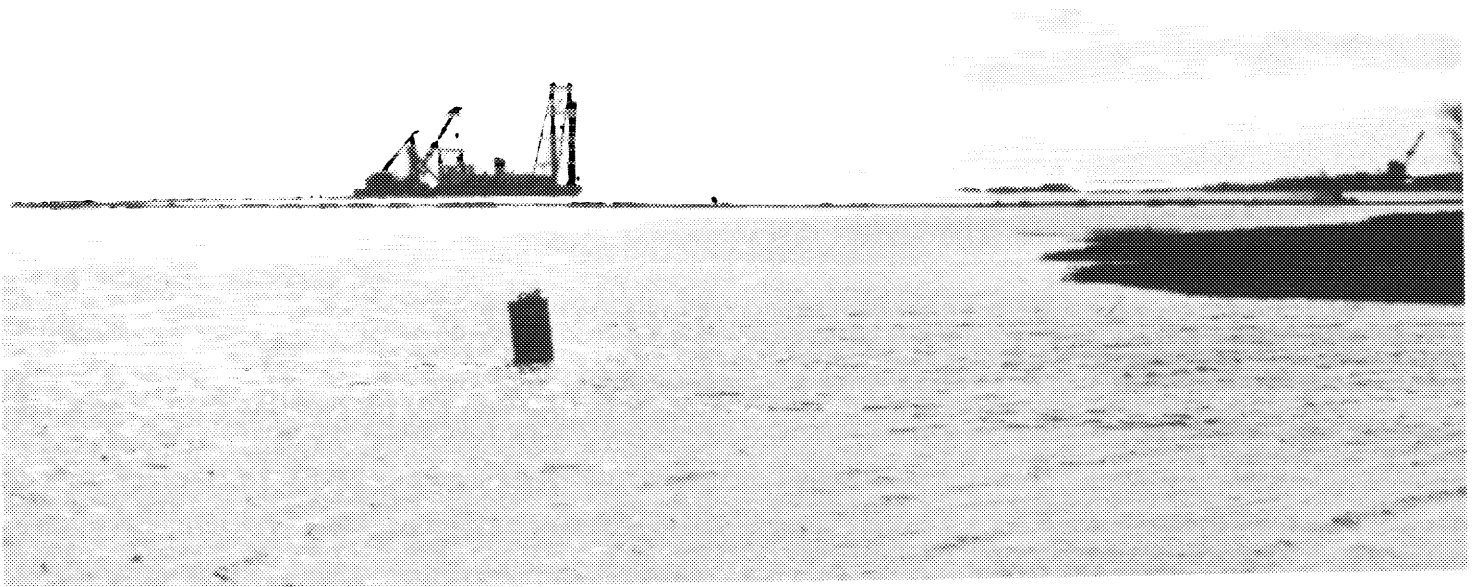

Long Island Sound Studies
Feasibility Report

Dredged Material Containment



SEPTEMBER 1985



**US Army Corps
of Engineers**
New England Division



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
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LONG ISLAND SOUND STUDIES
DREDGED MATERIAL CONTAINMENT FACILITIES
Feasibility Report

New England Division
U.S. Army Corps of Engineers
Waltham, MA

September 1985

SUMMARY

PURPOSE AND SCOPE

The coastal resources and their accessibility have shaped the development patterns of the Long Island Sound (LIS) region and have contributed significantly to its economic well-being and recreational enjoyment. The ports and harbors and waterfront facilities which serve the shipping and boating industries have historically played a major role throughout the region's development. Currently, the extent and nature of today's shipping have evolved to the point where heavy reliance is placed on safe and unimpeded access to port facilities. In most cases, this level of service is contingent on dredging. The States of Connecticut and New York have taken the position that dredging must continue as needed if the ports and harbors are to retain their prominence in handling waterborne commerce and recreational boating traffic. However, this is not to imply that dredging and accompanying disposal is being permitted at any cost - either economically or environmentally.

Over the years, the dredging and disposal of dredged material have evolved into carefully planned and monitored procedures under the ever increasing watchfulness of Federal and State agencies and the public. Nevertheless, even after 100 years of management of this program in LIS, it remains a very controversial issue. In this period, dredging interests have seen disposal options narrow to a closely regulated situation today which has directed the majority of dredged material disposal to four open-water sites in Long Island Sound. Historical records from 1961 to 1979 indicate 70 percent of disposal was at open-water sites, with the remaining 30 percent at land disposal areas.

It was because of the continuing evaluation of disposal policy and the persistent controversy over both open water and land disposal that the LIS congressional interests requested the Corps to study the feasibility of dredged material containment facilities in the Sound. Accordingly, the Corps initiated the study in FY78 and during its course has:

1. Examined the past and future dredging and disposal needs in the region and estimated that 60 million cubic yards of dredged material from LIS harbors must be dealt with over the next 50 years.

2. Developed procedures and criteria for identifying and screening potential sites. Identified factors considered to be most important include:

- Site Bathymetry/available containment volume
- Shoreline ownership
- Significant wetlands and ecological areas
- Major public beaches
- Wave energy
- Land ownership compatibility/reuse potential.

3. Examined the coastal and offshore areas of LIS for potential containment facilities. This process alone identified and evaluated over 300 potential sites for containment facilities.

4. Addressed many potential environmental and socioeconomic impacts that are related to containment.

5. Performed detailed engineering, economic and environmental studies on selected prototype sites to test the feasibility of constructing a containment facility in the LIS environment.

6. Initiated a public involvement effort through a program of brochures, workshops, media appearances, public appearances and maximum availability and exposure to the public.

7. Examined policy issues related to containment.

POTENTIAL BENEFITS OF CONTAINMENT FACILITIES

Whereas the concept of containment facilities for dredged material disposal has been widely accepted in other parts of the United States and other parts of the world it has not seen widespread use in the LIS region. In other parts of the nation, especially at mid-and southern Atlantic ports and in the Great Lakes, containment facilities have been used for economical and environmentally acceptable disposal of dredged material. Facilities such as Craney Island in Norfolk Harbor, Virginia; Dickinson Island on Lake St. Claire and the Pt. Mouille facility in Michigan; and the Hart and Miller Island site in Maryland are a few of the many sites where joint federal and local interests have built successful containment facilities. Consequently, the LIS coastal community initially greeted the concept of dredged material containment with enthusiasm, viewing it as a potential supplement to open water disposal in specific situations where environmentally and/or economically advantageous and to gain productive use of material.

The disposal of dredged material in LIS, at both land or open water sites, remains environmentally controversial. NED is presently achieving a high level of success in minimizing environmental impacts from open-water disposal, but along with other agencies and environmental interests, continues to press for further evidence of the effectiveness of disposal operations as well as the potential long range impacts. As absolute answers are not available, these are topics of significant study by the Corps. Although containment is not able to offer assurances of no impact, under certain conditions it may provide a more acceptable means of disposal.

It is Corps policy to seek maximum practicable benefits through productive use of the materials dredged from the nation's ports and harbors, provided such use is in the public interest. Potential uses may include creation of wetlands, nourishment of beaches, erosion control and land reclamation.

In specific cases, disposal of dredged material at containment facilities may offer economic advantages to the Federal Government and local interests when compared to disposal at one of the currently designated open-water sites. In LIS where the number of open water disposal areas has been reduced from 19 to 4 and the use of land disposal restricted, the costs associated with increased transportation distances has placed considerable economic pressure on private marina owners and small dredging companies. Faced with increased cost, these interests are not able to achieve the economies of scale available to the Federal Government and other large operations.

STUDY FINDINGS

The containment study identified over 300 potential containment sites in the New York and Connecticut waters of LIS. From this large number of sites, five were identified as being deserving of more detailed investigation and represent the basis of this report. The five sites include: Clinton Harbor, Black Ledge, Penfield Reef, Milford Harbor and Sherwood Hole. Many other sites exhibiting still higher rankings for technical feasibility were the subjects of intense local opposition for social or environmental reasons which eliminated them from further consideration.

CLINTON HARBOR

The Clinton Harbor containment proposal was formulated as a marsh creation site adjacent to the Clinton Harbor federal navigation channel and local boating facilities. The \$2 million containment site could store up to one million cubic yards of dredged material and meet the local disposal needs for up to 25 years. Under these conditions dredged material could be pumped directly into the containment facility with a low-cost hydraulic dredging operation which makes this site economically competitive with other disposal options despite the costs to construct the containment dikes. In addition, environmental benefits could be realized as the marsh is filled and planted with wetland vegetation, which would add to the existing Hammonasset wetland areas. However, there are several negative factors which include: marginal economics, conflicts with the town of Madison aquaculture plans, designation of the area as a federal coastal barrier beach and also as a State Natural Area Preserve, and the lack of local financial commitment. Under these conditions there is inadequate justification to pursue a containment project at Clinton.

BLACK LEDGE

The Black Ledge site was formulated as a large offshore island which could accommodate the dredged material disposal needs for the eastern Connecticut coastal area, from Niantic Harbor eastward, for up to 50 years. With a capacity of 7.5 million cubic yards, the facility would require about 9200 feet of dike constructed in 5 to 35 feet of water at an estimated cost of \$40 million. This cost level makes the facility economically infeasible.

It would be possible to create wetland areas as the facility is filled. However, the Black Ledge site is presently a productive habitat area supporting a diversity of species with dense concentration of blue mussels. The environmental impacts and unfavorable economics currently make this site infeasible.

PENFIELD REEF

The Penfield Reef containment facility was considered at two configurations at the site of an eroded peninsula off the town of Fairfield coast. The original was an \$8 million facility holding about one million cubic yards of dredged material. As such the facility could accommodate the disposal needs for the Bridgeport area through hydraulic dredging operations with the help of booster pumps for distances beyond a mile. Alternatively, the outer portion of the peninsula could be widened to accommodate up to 4 million cubic yards for \$8.6 million. This larger facility could serve regional disposal needs. Because of the first cost neither alternative is economically feasible.

The major drawbacks of a site here center around environmental concerns. The Penfield Reef area is considered an environmentally productive habitat area supporting a large, diverse population of species. While the containment facility would have habitat value of its own and could be sited to avoid the highest value existing habitat, the overall impact would be negative.

The town of Fairfield is interested in a containment facility at this location, not primarily as a disposal area, but as a structure which could provide protection from waves and beach erosion.

MILFORD HARBOR

The Milford Harbor containment proposal was sited at the mouth of Milford Harbor adjacent to the federal navigation channel. A one quarter million cubic yard facility could be constructed for about \$2.6 million and could handle disposal needs for Milford Harbor for up to 50 years. Considerable savings could be realized from possible use of a hydraulic dredging operation but not enough to offset the costs of the containment facility. Other drawbacks include the close proximity of the town's Gulf Beach facility. Environmental sampling at nearby areas indicate that this area is not particularly productive and major environmental impacts would not be expected.

SHERWOOD HOLE

Sherwood Hole is representative of aqueous borrow pits that exist along the coast of LIS. Unlike the other containment sites examined by this study these areas already exist and would entail no construction costs. The isolated nature of these borrow pits has generally resulted in an anoxic environment which supports only reduced numbers and species of

life. If these areas were to be filled, the environment would more resemble that of the surrounding area. Future use as a disposal area is a worth-while consideration.

CONCLUSIONS

The Corps historically has found that there is no single best disposal choice for all dredging projects. Therefore, the New England Division analyzes each project on an individual basis to determine the most appropriate disposal option. While there has been considerable controversy surrounding the disposal of dredged material in LIS, there is presently an overriding general acceptance of current disposal options, namely, open water disposal at the four designated sites and land disposal whenever possible. There is also potential for dredged material containment facilities as evidenced by the 300+ sites that were identified during this study. However, the findings of this study indicate that containment is generally more costly, introduces environmental conflicts of its own, lacks widespread public support and has not achieved the required local financial sponsorship needed for implementation. As a result we have concluded that containment, while potentially feasible on a project specific basis, does not compete favorably with other disposal options. The aqueous borrow pits, such as Sherwood, may be included in those projects considered feasible but their availability is limited and further study and public input would be required. In general, containment offers limited opportunities as a feasible alternative for the disposal of dredged material in Long Island Sound.

Public reaction to the findings, which indicate a lack of feasibility, has been mixed. The State of Connecticut and others support the conclusion on economic and environmental grounds. There are also advocates of containment including Congressional and local interests who seek federal participation on implementing containment. Letters of comment on the public review draft have been attached to the report.

In retrospect, the findings of this study provide insight into long standing questions concerning the feasibility and applicability of dredged material containment studies in LIS. Directly it provides the response to the 1977 Congressional Resolution which authorized this study to determine the feasibility of containment. The study also responds to long standing, open ended questions raised by two earlier publications: namely the Interim Plan for Disposal of Dredged Material in LIS (NERBC, 1980) and the Programmatic EIS for Disposal of Dredged Material in the LIS Region (Corps of Engineers, 1982). Both documents gave approval to open water disposal and deferred questions regarding the feasibility of containment to completion of this study.

While the general finding of this study indicates a lack of feasibility of containment on an LIS-wide basis and no visible role for the federal government, as stated above, it does conclude that local interests may determine that it may be feasible on a case-by-case basis. This report

and the following supplemental data reports generated by this study will provide useful guidance and information for future considerations.

SUPPLEMENTAL DATA - VOLUME 1 (Plan Formulation)

- Interim Siting Analysis
- Addendum - Extension of Siting Analysis
- Island/Shoal Screening

SUPPLEMENTAL DATA - VOLUME 2

- Progress Report (Feb 83)
- Engineering Reports

SUPPLEMENTAL DATA - VOLUME 3

- Social and Economic Impacts
- Market User Survey
- Workshop Digest

SUPPLEMENTAL DATA - VOLUME 4 (Clinton Environmental Reports)

- Environmental Baseline Data
- Benthic Algae and Fauna
- Wave Energy Analysis and Sediment Transport

SUPPLEMENTAL DATA - VOLUME 5 (Environmental Reports)

- Environmental Baseline Data - Black Ledge
- Ecological Surveys - Penfield Reef and Milford Harbor
- Analysis and Site Evaluation - Black Ledge, Penfield Reef, and Sherwood Borrow Pit
- Benthic Sampling - Mamaroneck Harbor
- U.S. Fish and Wildlife Planning Aid Letters

The public is invited to contact the New England Division (NED) to access this data at the NED office or other locations in the LIS coastal area.

In addition to the above sources of data and analysis, the study process gave to the LIS coastal community the opportunity to discuss the pros and cons of containment facilities and an opportunity to choose an alternative to current disposal practices.

Based on the study findings and public input, we are recommending that there is no federal interest at the current time regarding the implementation of containment facilities in LIS.

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ATTACHMENT

1	Public Review and Comments Responses to Comments Letters of Comment	
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INTRODUCTION

INTRODUCTION

BACKGROUND

Long Island Sound has been used for the disposal of dredged material and other urban-industrial wastes for more than 100 years. The management of these disposal activities in the sound began in 1888 when the Port Supervisors Act prohibited disposal outside of designated areas. Since then, 20 open water sites as well as many more land sites have been used for dredged material disposal.

While dredging and disposal of dredged material in the sound continue to be closely scrutinized and in some cases curtailed completely, the need for such disposal has not diminished. Dredging is critical to the maintenance of the region's commercial and recreational harbors, particularly if they are to retain their prominence in handling waterborne commerce and an ever increasing recreational boating need. The disposal of dredged material is being managed to reflect a combination of environmental, social and economic factors.

CURRENT DISPOSAL PLAN

The issues surrounding the disposal of dredged material continue to receive considerable attention from navigation interests and federal, State and local governments. A plan has been implemented that established use of four open-water disposal areas to handle the bulk of dredged material. These regional dredged material disposal areas are the Central Long Island Sound site off New Haven, the Cornfield Shoals site off the Connecticut River, the New London site off the Thames River and the Western Long Island Sound (WLIS) III site off South Norwalk. All four sites are being closely monitored by the New England Division of the Corps of Engineers (NED) through its Disposal Area Monitoring System commonly known as DAMOS. Monitoring of these carefully controlled open-water disposal areas as well as any land disposal activities have to date revealed insignificant or acceptable impacts. Because of this, there is general institutional and private support for their use.

Environmental Concerns. The process of developing projects and assessing their merits is being continuously evaluated for environmental reasons. The Corps follows procedures that are in line with Federal and State regulations which call for consideration of alternatives. Therefore, a full array of alternatives is considered and analyzed for each project so as to minimize and avoid environmental impacts while giving consideration to economic and technical feasibility. Each alternative brings with it advantages and disadvantages.

Economic Considerations. In the past, as a general practice and for economic reasons, approved disposal sites were not far removed from harbors to be dredged. However, when open-water sites were reduced from 19 to three (and then increased to four) sites and as land disposal sites became filled or unavailable, many dredgers began to feel the impacts of

increased cost. With the regional sites concept, the distance from some harbors to disposal areas increased significantly. In the case of larger operations some of these increased costs can be absorbed or reduced through economies of scale, but such opportunities are not available for the smaller dredgers.

Alternatives. Available alternatives for meeting future disposal needs while responding to present issues and problems include:

- Open-Water Disposal - Continued use of existing or new open-water sites but subject to carefully controlled and monitored operations. These sites have sufficient long-term capacity to handle disposed needs well beyond the 50-year planning period of this study.
- Land Disposal - Although available on a limited project specific basis, stringent water pollution regulations, coastal wetlands restrictions and shore front development continue to curtail this option as an available alternative.
- Containment Facilities - Used successfully in other regions of the United States but not in Long Island Sound.
- Beach Nourishment - Feasible on a project specific basis particularly if a nearby beach is available and the dredged material is compatible.

In as much as disposal methods are determined on a project specific basis the approach of selecting the least cost alternative which results in the least environmental harm generally favors open water disposal.

PURPOSE AND SCOPE

This study considered the feasibility of locating containment facilities for dredged material disposal in Long Island Sound. The study area covered the entire Long Island Sound region in Connecticut and New York. Containment, as considered in this report, generally involves disposal of dredged material in a diked area as conceptually shown in Figure 1. The study objective was to determine containment feasibility by identifying potential sites; develop screening criteria; discuss the future dredging and disposal needs, obtain public participation and reaction to the concept of containment; identify the issues associated with containment; develop detailed engineering, environmental and economic analysis of selected potential containment facilities; and explore the potential of constructing one or more of these facilities as a "prototype site".

STUDY AUTHORITY

The authority to conduct this study is contained in a resolution of the Committee on Public Works and Transportation, U.S. House of Representatives adopted 10 May 1977 which reads as follows:

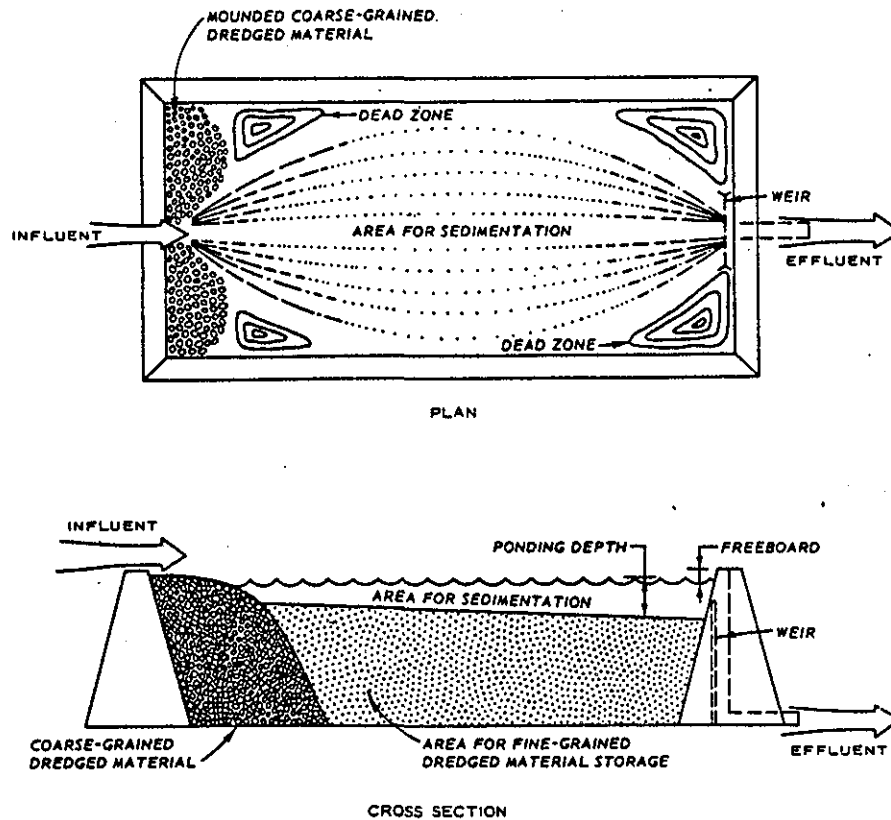


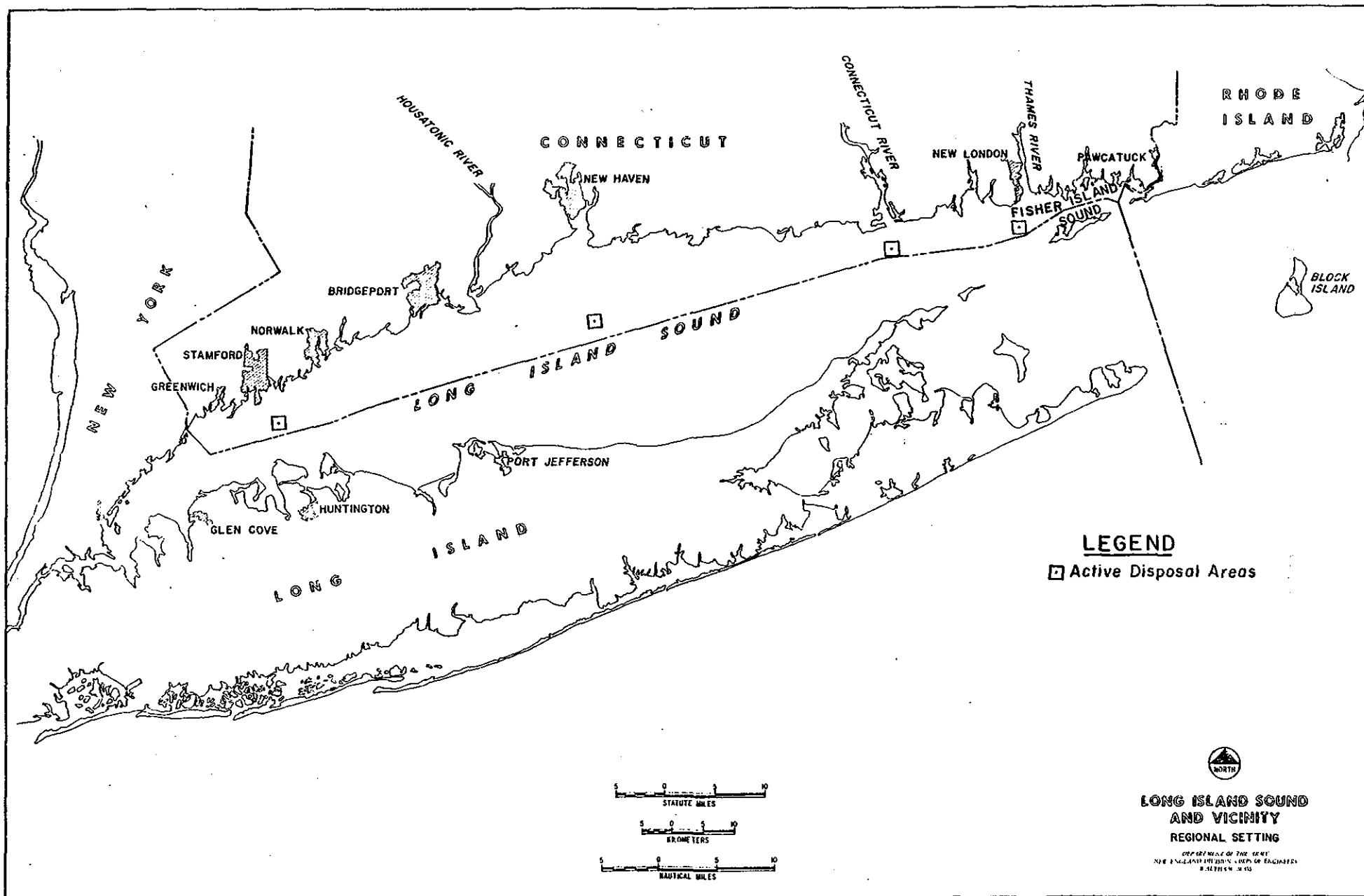
FIGURE I CONCEPTUAL DIAGRAM OF A DREDGED MATERIAL CONTAINMENT AREA

Resolved by the Committee on Public Works and Transportation of the House of Representative, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports on the Land and Water Resources of the New England-New York Region, published as Senate Document Numbered 14, Eighty-fifth Congress, First Session, and other pertinent reports, with a view to determining the feasibility and impacts of the treatment and use of the dredged materials to result from the continued maintenance and anticipated improvements of Long Island Sound harbors, as well as from any newly created Federal harbors, to build artificial islands in Long Island Sound for recreation, conservation, marsh building, development, and other purposes. The study should also consider the utilization of dredged materials from projects other than Federal (i.e., State, community, and private), and the feasibility and acceptability of utilizing solid wastes other than dredged materials for island building.

Since no waste disposal activities other than for dredged material are permitted in the sound, the study did not consider disposal of solid wastes.

STUDY AREA

Long Island Sound is one of the nation's unique and irreplaceable natural resources. The study limits include the area within Long Island Sound and Fishers Island Sound extending from Throgs Neck Bridge in New York eastward to the Connecticut-Rhode Island State line. Its 1300-square mile water surface area is an almost fully enclosed arm of the ocean bordered by nearly 600 miles of coastline (see Figure 2). The sound is 113 miles long and 21 miles wide and contains about 125 islands. About seventy-five rivers and streams of various length including the Connecticut, Housatonic and Thames Rivers, drain a 16,000-square mile area surrounding Long Island Sound. Long Island Sound exhibits estuarine characteristics in its western and central parts and embayment characteristics in its eastern third. Depths vary greatly throughout the sound, averaging 80 feet with a maximum depth of 320 feet. Due to the effects of tides and freshwater inflow conditions, movement of water within a major estuary such as Long Island Sound is complex.



**RELATED REPORTS
AND PROGRAMS**

RELATED REPORTS AND PROGRAMS

This study is related to other LIS studies concerning dredged material management. Recently completed study efforts are described as Prior Reports. There is also a section on Related Programs which describes monitoring and research programs for dredged material management. Similarly, this report is the culmination of a comprehensive study effort for which many supplemental data reports have been prepared. A synopsis of these reports is included here.

PRIOR REPORTS

Programmatic Environmental Impact Statement (June 1982)

The Programmatic Environmental Impact Statement (PEIS) by NED for the disposal of dredged material in the Long Island Sound Region assesses several potential open water disposal sites throughout the region and generically discusses other disposal alternatives; specifically, upland, containment, beach restoration, incineration and resource reclamation. This document provides an informational basis upon which supplemental statements or assessments can be developed for individual projects.

The following appendices were prepared as part of the PEIS document:

- Appendix A - Environmental Report for Open-Water Disposal
- Appendix B - Long-Term Impacts of Open-Water Disposal
- Appendix C - Economic Analysis of Future Dredged Material Disposal
- Appendix D - Federal Institutional Requirements
- Appendix E - Public Participation.

The Environmental Impact Statement for the Designation of a Disposal Site for Dredged Material in Western Long Island Sound - WLIS III (Feb 1982)

The EIS for WLIS III is tiered to the PEIS. It specifically addresses the need and the impacts of using the proposed site drawing upon information from the PEIS as well as more specific data generated via the Corps' Dredged Material Research Program (DMRP) and the Disposal Area Monitoring System (DAMOS). The final EIS was published in February 1982 and use of the site began in March 1982.

Interim Plan for the Disposal of Dredged Material from Long Island Sound (August 1980)

The Interim Plan is the culmination of discussion and negotiation among New York, Connecticut, Federal and interstate agencies responsible for regulating dredging and disposal in Long Island Sound. The New England River Basins Commission served as a forum. The result was a consensus to continue open water disposal at three designated areas on an interim basis until a thorough evaluation of alternative courses of action (such as upland disposal, island building and marsh creation) would be completed and a long-term management plan formulated. Currently, disposal continues in a carefully controlled and monitored manner at disposal areas near New London, Cornfield Shoals, New Haven, and more recently at the Western LIS III site.

New Haven Harbor Coastal Development for Navigation (1981)

The New England Division prepared this feasibility report for improving New Haven Harbor which is the largest port in Connecticut, and also the largest source of dredged material with some 12 million cubic yards of Federal dredging projected for the 1985 to 2035 time frame. The report recommends removal of an estimated 4.4 million cubic yards of dredged material to improve the harbor.

Bucket dredges are proposed for dredging. All material would be transferred into dump scows and transported to two open-water sites. Disposal operations would take place in the harbor about 1 mile east of the ship channel at Morris Cove by filling a manmade hole, left by earlier mining operations, with about 900,000 cubic yards of suitable materials including 27,200 cubic yards of rock. The remaining volume, some 3.5 million cubic yards, would be deposited at the Central Long Island Sound Disposal site located about 6 nautical miles south of the entrance to New Haven Harbor. The Morris Cove site, one of the containment sites being evaluated by this study, was also studied under the DAMOS program but was found unsuitable for disposal of fine material because of strong currents and circulation patterns.

DREDGED MATERIAL CONTAINMENT STUDY SUPPLEMENTAL DATA REPORTS

Reconnaissance Report (January 1979)

This initial effort outlined the purpose and scope of the study and provided preliminary information on dredged material volume and previous and existing disposal locations. Plan formulation efforts centered around locating and evaluating large volume regional sites. The Reconnaissance Report compared rock dikes with sheet pile structures and concluded that rock dikes were less expensive and more appropriate for most containment facilities in LIS except where space was at a premium.

Dredged Material Containment in Long Island Sound - Site Screening
(Interim) Report (July 1980)

This status report presents an overview of the feasibility of containing dredged material along Long Island Sound and addresses several major points including:

1. Evaluated historical dredging quantities.
2. Projected future dredging requirements for a 50-year period 1985 to 2035.
3. Identified engineering and design considerations.
4. Developed the methodology for site identification and screening.
5. Applied the methodology to Long Island Sound, resulting in the identification of 133 potential containment sites which in all cases were located adjacent to publicly owned shoreline.
6. Of the 133 identified sites, 24 sites were ranked as the highest based on screening criteria.

Dredged Material Containment in Long Island Sound - Site Screening
(Addendum) Report (January 1981)

The interim report described above, located and evaluated 133 public shorefront sites. This Addendum expanded the screening process to include 121 other sites located adjacent to private or other public shorefront. This effort used a screening process similar to the previous report but went further by performing sensitivity analyses of screening and weighting factors. Of the 121 sites so identified, about 50 were ranked superior to the rest.

18-21 May 1981 Workshop Digest (1981)

The Workshop Digest documented for those attendees and other interested individuals, a summary of the topics discussed as well as the issues and questions raised at the four workshops held in May 1981. The digest includes an outline and explanation of the workshop format, the purpose of these meetings, a summary of each session, and the issues, concerns, and questions of the participants. The public information program is explained. Samples of all the press releases, announcements and articles publicizing the workshops are also exhibited followed by samples of the media coverage generated by the workshops. Written communication received from State officials, local leaders and concerned citizens, together with a list of workshop attendees, are included.

Market User Survey (August 1981)

This report summarizes the navigation activities at the 50 ports and harbors located on or adjacent to Long Island Sound. Projections of port

activities included in this market user survey are based on recent trends, planned port development, and anticipated changes in shoreline activities, including possible conversion of electrical generating plants from oil to coal. Survey findings conclude that harbors can expect continued high demand from commercial shippers and recreational boaters for continued dredging, along with continued concern over the availability and costs of disposal options.

Social and Economic Impacts of Prototype Dredged Material Containment Facilities in Long Island Sound (September 1981)

This study analyzed social and economic impacts associated with the construction of dredged material containment facilities at six potential locations along the Connecticut shoreline; namely Fayerweather Island in Black Rock Harbor, Yellow Mill Channel in Bridgeport Harbor, Morris Cove in New Haven Harbor, Clinton Harbor, Twotree Island off Waterford, and Black Ledge at the mouth of New London Harbor. The study examines the short-term impacts during construction of dikes, filling with dredged material, dewatering, final capping, contouring and planting; as well as long-term impacts involving final use.

Dredged Material Containment Study - Prototype Report - Clinton Harbor and Black Ledge (April 1982)

This New England Division report documents regional geology of the LIS Region and site geology at two prototype containment facilities: Clinton Harbor and Black Ledge. The report also discusses design considerations and develops construction cost estimates for the facilities. Site conditions were studied employing field reconnaissance, subsurface explorations and survey.

Environmental Assessment of Prototype Marsh Creation and Containment Facility Sites (October 1982)

This report describes the existing physical and biological conditions at two prototype sites: Clinton Harbor and Black Ledge. Study findings are based on literature review, coordination with resource agencies, and limited on-site biological surveys. This information provided the basis for determining the most effective configuration of the facility, the potential for habitat creation versus commercial/industrial development, and the potential impact upon the adjacent environment. The report also addresses the resource value of the new habitat.

Dredged Material Containment Study - Site Screening Report (November 1982)

This report is similar to the geology and design report discussed above but deals with five other potential containment facilities. These are Milford Harbor, Yellow Mill Channel, Thames River, Penfield Reef and Mamaroneck Harbor. Site conditions are less detailed as no detailed field investigations were obtained.

Island Shoal Screening (February 1983)

This report reflects a preliminary screening effort to assess the feasibility of nine Connecticut off-shore coastal areas for use as containment facility sites.

Dredged Material Containment Feasibility Study Progress Report (February 1983)

This document reports on study progress and represents a reference source which presents in detail all aspects of the study including background, problems and needs, plan formulation process, public coordination effort and detailed site reports.

Dredged Material Containment Study-Penfield Shoal Site, CT. (April 1984)

This study represents a detailed geotechnical and engineering evaluation for the Penfield Reef site in Fairfield, Connecticut. The detail is similar to the analyses completed for Clinton and Black Ledge in the Prototype Report.

Dredged Material Containment Study-Milford Harbor Site, CT. (August 1984)

This report presents a detailed geologic and engineering evaluation for the Milford Harbor site in comparable detail to the Clinton, Black Ledge and Penfield sites.

ENVIRONMENTAL DATA AND SITE EVALUATIONS

Environmental Data for Clinton Harbor (March 1982)

This site specific report presents the following subjects:

1. Tidal Hydrodynamic Simulation
2. Sediment Profile Photogrammetry
3. Biotic Survey
4. Marsh Creation Feasibility and Design.

Environmental Data for Black Ledge (March 1982)

This study provides data on existing biotic communities at Black Ledge and compared the potential habitat of a containment facility with the present habitat.

Benthic Algae and Fauna of Clinton, CT (June 1982)

This document presents the results of a biological survey of soft and hard bottom benthic communities at Clinton.

Ecological Surveys of Penfield Reef and Milford Harbor (November 1982)

This report summarizes the results of biological surveys at Penfield Reef and the Burns Point Jetty site at Milford Harbor.

Wave Energy Analysis and Sediment Transport Study at Clinton Harbor (February 1983)

This report presents probable sediment transport effects, wave energy conditions and possible changes associated with the placement of a containment facility in Clinton Harbor.

Analysis and Site Evaluation at Black Ledge, Penfield Reef and Sherwood Borrow Pit (May 1984)

This report includes:

1. A discussion of wave modeling methodology and the wave climate for Long Island Sound.
2. A description of the physical and biological environment at Black Ledge and the impacts of a containment facility on waves, and physical, chemical and biological characteristics.
3. A description of the existing marine biological resources at Penfield Reef and Sherwood Borrow Pit and the potential impacts of a containment facility.

Results of Benthic Sampling from the Mamaroneck Harbor, NY (July 1984)

This is a report on a benthic survey conducted at three sites in outer Mamaroneck Harbor: Hen Island, Black Tom and Scotch Cape.

RELATED CORPS OF ENGINEERS' PROGRAMS

Disposal Area Monitoring System (DAMOS)

The Corps of Engineers (NED), as part of its mission of regulating open water disposal, initiated DAMOS which is a program of scientific inquiry into environmental effects of that activity. DAMOS addresses siting considerations, the relation of site recovery processes to biological succession, how much disturbance to permit at any one time, quantification of effects, and capping of contaminated material. There

are 10 major sites monitored in New England, in two tidal systems, and in ocean depths ranging from 60 to in excess of 200 feet and reaching distances of up to more than 10 miles offshore.

The DAMOS program uses oceanographic surveys including state of the art navigation and electronic instrumentation, underwater photography, diver observations and biological analysis. The findings of the program provide guidance for disposal and site management policies.

Dredged Material Research Program (DMRP)

Congress recognized a need for a comprehensive nationwide research program on the effects of dredged material disposal; accordingly, it authorized the Corps of Engineers to accomplish the Dredged Material Research Program (DMRP) between 1973 and 1978. In contrast to previous, largely site-specific, project investigations, these studies were generic in nature with the intent of developing methods of predicting effects before a project is carried out. Results of conceptual and laboratory studies were tested in the field under actual project conditions so as to improve predictive capability.

Specific goals of the DMRP were to define the water quality and biological effects of open-water, upland, and wetland disposal; improve the effectiveness and acceptance of confined land disposal where it is considered a desirable alternative; test and evaluate concepts of wetland and upland habitat development using dredged material; and develop and test concepts of using dredged material as a productive natural resource.

A significant conclusion drawn from the DMRP is that no single disposal alternative (e.g., open-water disposal, confined upland disposal) is presumptively suitable for a geographic region or group of projects. What may be desirable for one project may be completely undesirable for another. Consequently, each project must be evaluated on a case-by-case basis. Additionally, each project evaluation must be made in full consideration of long-term as well as short-term disposal needs and possible interactions among projects.

Regarding the effects of open-water disposal, studies conclude that, unless the dredged material is highly contaminated, physical impacts are likely to be of greater potential consequence than their chemical or biological impacts. Serious short-term water quality effects are not likely unless the disposal site is geochemically dissimilar to the dredging site. Biological effects of an adverse nature are similarly unlikely due to the resiliency of most organisms (except in larval stages) and the demonstrated ability of many organisms to rapidly recolonize disposal sites. Over a longer term, certain aquatic organisms will uptake chemical contaminants; however, the patterns of uptake still remain unpredictable. Except in coral areas and during times of fish migrations

and spawning activities, turbidity is much more likely to be only an aesthetic problem rather than a biological problem. Irrespective of this, certain turbidity control measures are feasible under certain circumstances as indicated by field tests.

Confining dredged material on land can offer increased environmental protection, but is not without problems and is not always beneficial. Soil geochemical conditions in diked containment areas sometimes can enhance rather than retard contaminant release; thus effluents and leachates must be carefully evaluated as to their potential effects. As a result of DMRP research results where confined sites are desirable, they can be improved greatly over present practice in terms of design, construction, operation, and management. Particular areas of improvement include effluent regulation, storage capacity, dike design, and internal environmental conditions and aesthetics.

Several major DMRP field test and demonstration projects have proven the viability of using dredged material to develop both wetland and upland wildlife habitats in a variety of environmental situations. As a result of specific studies, guidance is now available as to what species to plant for a desired habitat, how and when to plant them, how to place and protect the dredged material, and what subsequent site management may be necessary. Additional information was generated on the relative productivity of various marsh plant species (data important in determining relative wetland-area values), the recovery of species buried by disposal, factors involved in ecological succession, and methods of predicting the possible uptake of chemical contaminants by marsh plants.

FIELD VERIFICATION PROGRAM (FVP)

The joint Corps and EPA Field Verification Program (FVP) is a cooperative effort to field verify dredged material testing procedures for predicting the impact of open-water disposal, upland disposal and wetland creation.

In the spring of 1983, approximately 77,000 cubic yards of dredged material from Black Rock Harbor were placed in the northeast corner of the Central Long Island Sound disposal area. A joint Corps/EPA monitoring effort was conducted at the site prior to, during, and after disposal. Scientists at the EPA lab in Narragansett, RI, are currently conducting experiments to validate on-site evaluation. Also, a test site has been leased on United Illuminating (UI) property in Bridgeport for evaluation of the upland and wetland portions of the FVP. In the fall of 1983 approximately 6,500 cubic yards of material dredged from Black Rock Harbor were used at the UI site to construct 1.1 acres of upland and wetland to enable the effects of dredged material to be studied in these different settings. This study is expected to be completed by the end of 1987.

**THE ROLE
OF THE PUBLIC**

THE ROLE OF THE PUBLIC DURING THE STUDY

PUBLIC INVOLVEMENT PROGRAM

Objective

Having had experience in dredging through its navigation and regulatory programs, the Corps was well aware of the high level and intensity of public interest regarding dredging and disposal. Cognizant of this interest, the Corps developed a comprehensive program to effectively merge public interest into the study. The program was outlined to accomplish the following:

1. Educate the public on the technology of containment.
 2. Inform the public on study status and findings.
 3. Seek out feedback on various concepts and proposals.
 4. Encourage active participation of all interests.
- Some of the public involvement tools are described below.

Brochures

Spring 1981 Information. The public involvement program essentially began with the dissemination of a public information brochure to approximately 2,500 State and local officials, newspapers, radio and television stations, commercial and industrial interests, public interest groups and individuals. The brochure entitled, "Long Island Sound Dredging and Disposal: The Search for a Solution" was designed to increase the public's awareness and understanding of the containment concept, one of several dredged material disposal alternatives. The nature of the study, the issues and problems associated with containment, the unique Long Island Sound ecosystem, the characteristics of dredged material, the site selection criteria and the planning process were also explained in the brochure. The brochure is reprinted in the Progress Report.

October '81 Update. This public information update, distributed to approximately 2000 people and groups, was intended to serve as a follow-up to the brochure and the workshop meetings held in May. This update included a brief summary of the work items recently completed or underway, various analysis and screenings being conducted, and the reports which were completed or being written.

Autumn '82 Update. The Update was similar to the '81 Update reporting briefly on the reports and activities which had been completed in the interim.

Workshops

A series of four extensively publicized workshops were held 18-21 May 1981 to supplement and expand upon the information supplied in the brochure. All four meetings; (held in New London, CT; New Haven, CT; Stamford, CT; and Great Neck, NY) were well attended with approximately 60 people at each, representing a wide range of interests and knowledge. The Long Island Sound Taskforce, which is the regional chapter of the Oceanic Society, served as moderator at each of the workshops. The workshops served as an excellent medium to transfer information to the public concerning the study. Likewise, the sessions provided a chance to hear the following primary concerns of the public regarding containment

1. The potential for release of toxic and other polluting substances into the marine environment
2. The ecological impact centering on the effects of construction
3. The costs of containment versus other disposal options including the responsibilities of cost sharing
4. The process of site consideration and selection including the availability of baseline data and involvement of the public

The exchange of information and discussion of issues provided a valuable study input. The Taskforce prepared a Workshop Digest, which is a summary of the proceedings and open discussion sessions.

Local Meetings and Media Releases

The high level of interest in this study, and in dredging and disposal in Long Island Sound, was evidenced by the number of requests for information from the media and local interests. Therefore, Corps personnel responded with many public appearances and presentations at meeting of local officials, civic and resource groups, and planning boards. Information was similarly made available to media through releases and interviews.

Progress Report - February 1983

This progress report takes a comprehensive look at the study as of that time frame. Its purpose was two fold:

1. To inform the public of study status.
2. To disseminate the available information and technical analysis generated by the study to enable the public to participate in further planning activities. It remains a valuable reference source because of its detail and completeness.

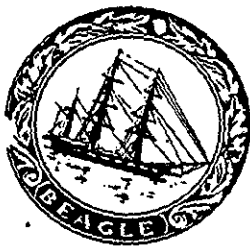
AGENCY COORDINATION

We have coordinated our planning efforts with all pertinent local, regional, county and State agencies. Representatives of many of the various agencies attended the May 1981 workshop meetings. In addition to telephone contacts and letters, communications have been maintained through the Public Information Brochure and updates. Coordination with the State of Connecticut has been through their Department of Environmental Protection and Department of Transportation. Regional planning agencies which have been kept informed of our activities are: Southeastern Connecticut, Connecticut River Estuary, Greater Bridgeport and Southwestern. Cooperation of local waterfront and harbor groups would be extremely important in implementing a containment project.

In the State of New York, coordination has been through the Department of Environmental Conservation. Also in New York we have contacted the Nassau County Department of Public Works (DPW), the Suffolk County DPW, and the New York City Ports and Terminals. We have also met with the Long Island Regional Planning Board to discuss the containment study and its applicability to Long Island.

PARTICIPATION IN PLAN FORMULATION

The public involvement in the plan formulation process included the identification of potential containment sites as well as review of the sites identified in the site screening process. This was valuable input since local interests had a good understanding of their harbors in terms of dredging and disposal operations and potential interest in containment facilities. This containment study was the catalyst to start community action and the potential avenue to move a project forward. The sites that were advanced to the detailed study phase were initially suggested or endorsed by the public.



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Dear Coastal Citizen:
You are invited
examining the
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material.

**WORKSHOP MEETING DATES
AND LOCATIONS**
ALL MEETINGS AT 7:30 P.M.

New London, Conn. - May 18, 1981
Room 113
New London Hall
Connecticut College

New Haven, Ct.



US Army Corps
of Engineers
New England Division

LONG ISLAND SOUND
DREDGING AND DISPOSAL
THE SEARCH FOR A SOLUTION



Stamford

Great Neck, New York

Bowling Green
U.S. Maritime

DREDGED MATERIAL CONTAINMENT



US Army Corps
of Engineers
New England Division

DREDGED

LONG ISLAND SOUND

OCTOBER 1981

MATERIAL

CONTAINMENT

PUBLIC INFORMATION UPDATE



For more information contact:

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Waltham, MA 02254
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IV

DREDGING ACTIVITY

HISTORICAL AND PROJECTED

NEEDS AND OPPORTUNITIES HISTORICAL AND PROJECTED DREDGING ACTIVITY

Planning for the location and sizing of potential dredged material containment facilities required developing projections of dredging activities in the LIS region. As part of this process, historical data and information were listed and analyzed.

HISTORICAL DREDGING

Dredging activity, which is evident throughout the LIS region, can be categorized into two classes.

1. Improvement and maintenance dredging done by the Corps of Engineers. There are 45 Federal projects in the LIS area, 19 in New York and 26 in Connecticut. These are listed in Table 1.
2. Dredging done by other government agencies and the general public under Federal permits issued by the Corps. Most, but not all, of these areas are concentrated near Federal projects.

The incidence of improvement dredging, both Federal and non-Federal, has varied considerably in the past, but in general, it is declining. This can be attributed to several reasons including a slowdown in new waterfront development and activity due, in part, to existing extensive development, consolidation of port facilities, increased costs and issues concerning economic, environmental and social problems.

Maintenance dredging, though variable, has been much more consistent. Dredging is necessary to remove the sediment and silt that gradually accumulate in existing navigation channels. The sediments are derived from both marine and upland sources and the rates remain relatively constant over time. While the need for such dredging is based upon surveys and consideration of navigation difficulties, execution of individual projects depends on funding and regulatory approvals.

Examination of dredging records gives some indication of dredging quantities and where disposal was accomplished in the past. Generally, for Federal projects, over 80 percent of the dredged material has been disposed of in open water. Private permitted dredging was about equally divided between land and open-water disposal. Data for these assessments are given in Table 2, which presents data through 1979. In the past 5 years the trend has been away from land disposal. Two other observations have been made regarding historical trends. First, costs for upland disposal have averaged 30 to 50 percent of the costs for open water disposal. Second, the costs of open water disposal have more than doubled since the mid-1960's. These two trends provide the basis for understanding the concerns of small private dredgers over the cost of disposal since the closing of local dumping grounds and the increasing unavailability of land disposal sites.

Table 1

FEDERAL PROJECTS ON LONG ISLAND SOUND

<u>NEW YORK</u>	<u>CONNECTICUT</u>
Westchester County	Western Coastal Area
1. Port Chester Harbor	1. Greenwich Harbor
2. Milton Harbor	2. Mianus River
3. Mamaroneck Harbor	3. Stamford Harbor
4. Echo Harbor	4. Westcott Cove
5. New Rochelle Harbor	5. Fivemile River Harbor
	6. Wilson Point Harbor
	7. Norwalk Harbor
Nassau County	8. Westport Harbor and Saugatuck River
6. Hempstead Harbor	9. Southport Harbor
7. Glen Cove Harbor	10. Bridgeport Harbor
	11. Housatonic River
Suffolk County	
8. Huntington Harbor	Central Coastal Area
9. Northport Harbor	12. Milford Harbor
10. Port Jefferson Harbor	13. New Haven Harbor
11. Mattituck Harbor	14. Branford Harbor
12. Greenport Harbor	15. Stony Creek
	16. Guilford Harbor
New York City	17. Clinton Harbor
13. Eastchester Creek	18. Duck Island Harbor
14. Little Neck Bay	19. Patchogue River
15. Westchester Creek	20. Connecticut River below Hartford
16. Bronx River	
17. Flushing Bay and Creek	Eastern Coastal Area
18. Harlem River	21. Niantic Bay and Harbor
19. East River	22. New London Harbor
	23. Thames River
	24. Mystic River
	25. Stonington Harbor
	26. Pawcatuck River

Table 2
Disposal Methods in Long Island Sound
(1961 to 1979 unless noted)
Volumes in thousands of cubic yards)

Area	Total Volume	Land Volume	Disposal Percent	Open Water Volume	Disposal Percent
FEDERAL OPERATION AND MAINTENANCE ^{1/}					
CT	5,535	1,026	29	3,909	71
NY	650	50	8	600	92
FEDERAL IMPROVEMENT ^{1/}					
CT	2,872	814	28	2,058	72
NY	4,503	41	1	4,462	99
TOTAL FEDERAL PROJECTS ^{1/}					
CT Totals	8,408	2,440	29	5,968	71
NY Totals	5,153	91	2	5,062	98
Totals	13,561	2,531	19	11,030	81
PERMITTED DREDGING					
NY ^{2/} 1959-1979	11,015	6,079	55	4,936	45
1968-1977	1,951				
CT ^{3/} 1968-1977	4,018 ^{4/}	2,259	56	1,759	44

Notes:

- 1/ Source: Progress Report, Table III-I, FEDERAL refers to Corps of Engineers.
- 2/ Source: Interim Report, Table 2-8 and 2-10
- 3/ Source: Reconnaissance Report, Table 2-9
- 4/ Excludes 1974 New London Improvement Project by U.S. Navy (2,880,000cy)

PROJECTIONS OF DREDGED MATERIAL QUANTITY

Future dredging requirements at Long Island Sound ports depend largely on the level of future port activity. Changing conditions in type and level of activity determine the need for channel improvements, as well as for Federal maintenance dredging by the Corps of Engineers. A large amount of dredging by non-Federal sources is also common at dockside and between the dock and Federal Channel, at private marinas and yacht clubs, and beyond the limits of Federal channels and anchorages. Projections of future quantities to be dredged from these harbors are expressed in ranges corresponding to the Minimum Growth/Minimum Change, the Most Probable Future, and the Maximum Growth/Maximum Change Scenarios. Total quantities at Federal projects are calculated and based on historical dredging trends

There appear to be four community types in the study area corresponding to the four sedimentary types. The deposit-feeding community in the muddy area west of the ledge corresponds to the Nucula-Nephtys (bivalve-polychaete) assemblage described by Sanders (1960). The amphipod dominated community was found on the muddy sands with surface particle feeding mode. A mixed community of surface particle and filter feeders with low dominance is found on the gravel. A hard-bottom community dominated by Mytilus edulis is found on the ledge.

Fifty-two species of algae were recorded from subtidal stations. Rhodophyta species (Red Algae) comprised between 64 and 70 percent of the total species recorded at each station. Species richness and dominance was not related to depth or location. Chondria tenuissima (red algae) was the dominant species. The dominance patterns were strongly influenced by the dense concentrations of Mytilus edulis (blue mussel). Epiphytic and ephemeral species were dominant because of the substrate provided by M edulis and competition for hard substrate.

The Black Ledge area is a heterogeneous benthic habitat supporting a diversity of species. The high abundance of organisms suggests that the area provides food and habitat for large invertebrates and fish. The area experiences strong and periodic scouring. The placement of uncontained material would experience rapid dispersal.

The proposed facility would affect directly about 150 acres of productive benthic resources and remove approximately 75 percent of the existing Mytilus edulis community from the area. The facility would cause accumulation of finer grained sediments on the leeward side which may affect the surrounding benthic habitat.

The construction of the containment breakwater would replace some rocky habitat for Mytilus edulis and associated organism. A saltmarsh could be planted within the containment facility to provide a high value habitat. The proposed containment facility would impact on approximately 150 acres of significant biological resources. With proper design and alignment, impacts could be reduced and mitigated by new marsh creation.

If this project were to proceed, site specific studies would have to be undertaken to determine the kind and extent of mitigation required to compensate for the biological and other impacts. These studies would include existing natural resources, commercial and recreational fisheries, biological productivity, visual changes, odor, noise, aesthetic affects, land use, and archaeological resources.

TABLE 3

SUMMARY OF PROJECTED DREDGED MATERIAL QUANTITIES (C.Y.)
1985-2035

<u>Scenario</u>	<u>Coastal Area</u>	<u>Federal Maintenance Dredging</u>	<u>Non-Federal Dredging</u>	<u>Federal Improvement Dredging</u>	<u>Total</u>
Connecticut:					
Minimum Growth	Western	4,290,000	2,992,000	350,000	7,632,000
	Central	9,520,000	7,856,000	460,000	17,836,000
	Eastern	940,000	3,696,000	200,000	4,836,000
	Total	14,750,000	14,544,000	1,010,000	30,304,000
<hr/>					
Most Probable Future	Western	5,615,000	3,740,000	2,950,000	12,305,000
	Central	12,330,000	9,820,000	7,760,000	29,910,000
	Eastern	1,630,000	4,620,000	1,900,000	8,150,000
	Total	19,575,000	18,180,000	12,610,000	50,365,000
<hr/>					
Maximum Growth	Western	7,255,000	4,488,000	3,150,000	14,893,000
	Central	14,135,000	11,784,000	7,960,000	33,879,000
	Eastern	2,360,000	5,544,000	2,100,000	10,004,000
	Total	23,750,000	21,816,000	13,210,000	58,776,000
<hr/>					
New York:					
Minimum Growth	Westchester County	310,000	640,000	100,000	1,050,000
	Nassau County	120,000	556,000	100,000	776,000
	Suffolk County	187,000	3,228,000	100,000	3,515,000
	New York City	1,930,000	1,128,000	200,000	3,358,000
	Total	2,547,000	5,552,000	500,000	8,599,000
<hr/>					
Most Probable Future	Westchester County	410,000	800,000	400,000	1,610,000
	Nassau County	180,000	695,000	150,000	1,025,000
	Suffolk County	327,000	4,035,000	150,000	4,512,000
	New York City	2,465,000	1,410,000	300,000	4,175,000
	Total	3,382,000	6,940,000	1,000,000	11,322,000
<hr/>					
Maximum Growth	Westchester County	530,000	960,000	600,000	2,090,000
	Nassau County	220,000	834,000	400,000	1,454,000
	Suffolk County	409,000	4,842,000	400,000	5,651,000
	New York City	2,935,000	1,692,000	500,000	5,127,000
	Total	4,094,000	8,328,000	1,900,000	14,322,000
<hr/>					
Total					
Minimum Growth		17,297,000	20,096,000	1,510,000	38,903,000
Most Probable Future		22,957,000	25,120,000	13,610,000	61,687,000
Maximum Growth		27,844,000	30,144,000	15,110,000	73,098,000

Source; Progress Report. Table IV - 8.

CHARACTERISTICS OF MATERIALS DREDGED IN LIS WATERWAYS

The observed physical and chemical characteristics of sediments dredged within the harbors bordering LIS vary widely. Harbor sediments receive contamination from treated and untreated sewage discharges, industrial discharges, oil spills, urban runoff, and river discharges, depending on location. Within any given year, runoff from spring snowmelt or isolated precipitation events can drastically alter the sediment picture. Normal or low flows might be capable of moving only fine-grained particles, but the high discharges during floods can scour a river or estuary bed and transport even coarse-grained material long distances. Chemical/organic characteristics also will vary, but on a more predictable seasonal basis. Fertilizers, herbicides and pesticides, for example, will be introduced into the sediments via runoff from agricultural areas.

The mean concentrations of trace metals in Connecticut are consistently much higher than those observed in New York sediments. This is probably due to more intense industrial activity and to the greater annual runoff and sediment loads which occur in Connecticut Harbors as opposed to New York Harbors, especially those on the north shore of Long Island where drainage basin size is relatively small.

In the absence of more definitive knowledge on the pollution effects of dredged material, or the effects of specific pollutants found in dredged sediments at the disposal sites, physical and chemical parameters are used to provide guidance for biological testing of sediments and placing conditions on the disposal of the dredged material. Dredged material sediment as classified by NERBC in the Interim Plan is as follows:

	<u>Class I</u>	<u>Class II</u>	<u>Class III</u>
Percent oil and grease (hexane extract)	<0.2	0.2-7.5	>.75
Percent volatile solids (NED method)	<5	5-10	>10
Percent water	<40	40-60	>60
Percent silt-clay	<60	60-90	>90

Relative to the subjective probability for adverse environmental impact these parameters are ranked in descending order of significance: oil and grease > volatile solids > percent water > percent silt-clay.

Class I sediments are often relatively coarse-grained with high solids content. Volatile solids, oil and grease, heavy metals, and

potential pollutant concentrations are low. Class I materials include non-recent and recent sediments which are suitable for capping materials at open-water dump sites, for habitat creation projects, or rehandling for productive uses which include beach nourishment and landfill cover.

Class II sediments are often relatively fine-grained with moderate solids content. Class II materials may contain a moderate amount of potential pollutants, volatile solids, oil and grease, and metals, at levels often sufficient to be a cause for concern. A subjective evaluation of the dredge site and metals is needed to designate such materials as either "non-degrading" or "potentially degrading". Potentially degrading Class II material will be treated as Class III material. On the other hand, evaluation may show that some Class II material is suitable for habitat creation projects, capping Class III material, or landfill cover.

Class III sediments are usually fine-grained with low solids content. These materials often contain high levels of potential pollutants, volatile solids, oil and grease, and metals. Class III sediments may be judged "potentially degrading" or "potentially hazardous" based on the relative concentrations of pollutant constituents. The probability for Class III sediments being "toxic" to marine bottom fauna may be high. Subjective evaluation of metals and other pollutants, and objective review of bioassay and/or bioaccumulation test results, may be required to determine the suitability of Class III material for open water disposal at Long Island Sound regional disposal areas.

As a general policy, Class III material is not dumped at regional disposal sites unless it is capped with suitable Class I or Class II material. Therefore, the conditions under which Class III material may be disposed of may include both temporal and seasonal restrictions relating to the availability of suitable material for capping, or alternative management techniques directed towards the goal of maximum environmental protection. In addition, there may be certain circumstances under which open water disposal may be prohibited.

REGULATIONS

AND

POLICY

REGULATIONS AND POLICY PERTAINING TO
DREDGING AND DISPOSAL

THE REGULATORY PROCESS

The construction and operation of dredged material containment facilities in Long Island Sound are regulated at the Federal and State level. Federal participants include the Corps of Engineers and the Environmental Protection Agency (EPA). Coordination is also required with the U.S. Fish and Wildlife Service (US F&WS) and the National Marine Fisheries Service (NMFS). At the State level in New York and Connecticut, environmental protection agencies participate directly in permit issuance. Local zoning and/or public health and safety ordinances may also apply for those cases where shoreline extension projects are planned.

Federal Regulations

Four major Federal statutes directly affect all dredging and disposal actions:

1. Section 10 of the River and Harbors Act of 1899 provides that the construction or alteration of any structure in any navigable waters is prohibited without the authorization of the Corps of Engineers.
2. Section 401 of the Clean Water Act of 1977 requires the issuance of a water quality certification by the State prior to any dredging. Certification involves consideration of water quality impacts at the dredging site and the disposal site if located within State waters.
3. Section 404 of the Clean Water Act authorizes the Corps to issue permits for the discharge of dredged or fill material into U.S. waters. The selection and use of disposal sites will be in accordance with guidelines developed and administered by EPA.
4. Section 103 of the Ocean Dumping Act (Marine Protection Research and Sanctuaries Act of 1972) pertains to the transport of dredged material for ocean disposal at selected and approved disposal sites.

Other Federal and State acts which may directly influence dredging and disposal decisions are listed in table 4.

State Approvals

The States of New York and Connecticut have participated in developing the interim disposal plan for Long Island Sound. Their role is continuous since one of the first steps in the dredging and disposal process is to obtain the necessary State permits and State water quality certification. Lead agencies for the States are the Department of Environmental Protection (DEP) in Connecticut and the Department of Environmental Conservation (DEC) in New York.

Table 4

Environmental Statutes Applicable to Dredging and Disposal
in Connecticut and New York

Federal

National Environmental Policy Act, as amended 42 U.S.C. 4321, et seq.
Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661, et seq.
Endangered Species Act, as amended, 16 U.S.C. 1531, et seq.
Coastal Zone Management Act, as amended, 16 U.S.C.
Rivers and Harbors Act of 1899, 33 U.S.C. 401 et seq.
National Historic Preservation Act of 1962, 16 U.S.C. 4321 et seq.
Marine Protection, Research and Sanctuaries Act of 1972, 22 U.S.C. 1401,
et seq.
Clean Water Act of 1977 as amended, 33 U.S.C. 1251, et seq.
Resource, Conservation and Recovery Act of 1976, 42 U.S.C. 6901 et seq.
Safe Drinking Water Act of 1974, 42 U.S.C. ss 1421 et seq.
National Shellfish Sanitation Program
Clean Air Act as amended, 42 U.S.C. 7401, et seq.
Protection of Wetlands (E.O. 11990)

States

Connecticut Coastal Management Act of 1978 (Sections 22a-90 through 22a-112, Connecticut General Statutes)
Tidal Wetlands Statutes (Sections 22a-28 through 22a-35, Connecticut General Statutes and Regulations thereunder)
Inland Wetlands and Water Courses Act (Sections 22a-36 through 22a-45, Connecticut General Statutes and Regulations thereunder)
Structures and Dredging in Tidal, Coastal and Navigable Waters (Section 22a-359 through 22a-363 Connecticut General Statutes)
Mining of Sand and Gravel in Tidal and Coastal Waters (Section 22a-383 through 22a-390, Connecticut General Statutes)
Stream Channel Encroachment Lines (Sections 22a-342 through 22a-349, Connecticut General Statutes)
Water Discharge Permits (Section 22a-416 et seq., Connecticut General Statutes and Regulations therein)
Solid Waste Permit (Sections 22a-207 et seq., Connecticut General Statutes and Regulations thereunder)
Air Compliance Permits (Sections 22a-174 et seq., Connecticut General Statutes and Regulations thereunder)
Connecticut Environmental Policy Act (Sections 22a-1 through 22a-1f, Connecticut General Statutes)
Harbor Management Act (Sections 113K-113t, Connecticut General Statutes)
Tidal Wetlands Protection Law of 1973 (Codified Laws of N.Y., Art. 24 SS 0101-0602)
Freshwater Wetlands Protection Act of 1975 (Codified Laws of N.Y., Art. 24 SS 0101-1303)
Stream Protection Law of 1966 (Codified Laws of N.Y., Art. 15 SS 0501-0505)
Environmental Quality Review Law of 1976 (Codified Laws of N.Y., SS 0101-0115)
Local Land Use Authority of 1926 (Codified Laws of N.Y., Art. 16 SS 260-284)

In Connecticut, the State coastal management plan provides a common basis for the review of impacts of uses on both coastal resources and future water dependent development. The Coastal Management Act of 1972 (Public Act 78-152) provides the legal authority for insuring the State and local agencies review coastal impacts by means of unified goals and policies.

The Coastal Area Management (CAM) Unit within the Department of Environmental Protection, coordinates, supervises and assists the activities of existing State and local agencies in implementing coastal management requirements. The CAM Unit is responsible for reviewing the consistency of all Federal and private activities and development projects, which might significantly affect the coastal area. These activities and projects must be consistent with the management program to the "maximum extent practicable" (capable of being done to the fullest degree permitted by existing Federal law).

DREDGED MATERIAL DISPOSAL

In planning Federal navigation projects, the general policy of the Corps is to require local interests to provide without cost to the United States all suitable areas required for initial and subsequent disposal with dredged material and all necessary retaining dikes, bulkheads and embankments. This requirement applies specifically to disposal on land or behind bulkheads. Likewise, if a containment facility were identified as the designated site, the costs of the dikes and other containment features would become a local responsibility. However, for disposal at one of the four open water sites there are generally no separate local costs for the interim unless a more economical disposal option existed.

Maintenance of Navigation Projects

It has been past policy that maintenance and operation of Federal navigation projects shall be Federal responsibility accomplished at Federal cost. The provision and preparation of disposal areas is the responsibility of local interests unless authorizing legislation provides otherwise. However, Policy Issue No. 79-19 states that retaining structures (dikes) will be provided by the Corps unless the authorizing documentation indicates explicitly that such structures are a local responsibility. Should retaining structures become a new requirement for maintenance of the project for environmental reasons, the Corps would recommend that the local cooperation requirements be modified to include retaining structures unless an exception is justified based on special circumstances. The Corps will provide the necessary retaining structures until Congress modifies the local cooperation requirements.

Maximizing Use of Dredged Material.
Section 148 of Public Law 94-587.

This legislation calls for encouraging the use of management practices to extend the capacity and useful life of dredged material disposal areas so that the need for new disposal areas is kept to a minimum. The management practices, which may include construction of dikes, consolidation and dewatering of dredged material and construction of drainage and outflow facilities, may be implemented at Federal expense.

Section 150 of Public Law 94-587

This law authorizes the Corps of Engineers to expend up to \$400,000 to establish wetland areas using dredged material as part of an authorized water resources development project. For Section 150 to be applicable the following provisions must be met:

1. The environmental, economic and social benefits justify the increased costs.
2. The increased cost should not exceed \$400,000
3. The wetland will not be altered or destroyed by natural or manmade causes.

This law also requires that when a report on water resources development project is submitted to Congress the establishment of wetland areas shall be considered in the report. In the economic computations, the benefits of establishing a wetland shall be at least equal to the cost, which shall be borne by the United States.

The money expended under this authority must result in a complete, functioning wetland. The program is not designed to supplement the cost of a containment dike with the expectation of creating a wetland 30 years into the future. Shorter term results are sought and can be obtained through incremental, or phased construction. Non-Federal interests would normally retain ownership, be responsible for operation and maintenance, and provide assurances that the beneficial values of the wetland would be maintained.

PLAN

FORMULATION

PLAN FORMULATION

OBJECTIVES

The goal of the plan formulation process was to develop the information and procedures which could lead to conclusions concerning the overall study objective and determine the feasibility of dredged material containment facilities in Long Island Sound. To accomplish this, the process was directed at addressing the following planning objectives.

1. Identify potential containment facility sites for the disposal of dredged material which may be generated from Federal and non-Federal dredging activities in Long Island Sound.
2. Develop containment designs for Long Island Sound which are feasible from an engineering, construction and operational aspect.
3. Minimize the economic costs to potential users of containment facilities.
4. Minimize the environmental and social impacts of containment facilities.
5. Maximize the long and short term use potential of both dredged material and containment facilities.
6. Explore the legal, institutional and financial arrangements associated with containment of dredged material in Long Island Sound.

Disposal of dredged material at containment facilities is a new concept for Long Island Sound except for instances where shoreline or land disposal areas have been diked. There was also an earlier study and report, "Artificial Island and Platforms in Long Island Sound", prepared in 1974 by John McAleer as a consultant for the New England River Basins Commission. Approximately 60 possible sites, mostly islands and shoals, were identified but no recommendations were presented.

SITE IDENTIFICATION

The site identification and screening process evolved through several different studies and methods of analysis. In total, screening identified nearly 300 potential sites distributed throughout the sound. The multi-step screening process arrayed the sites into the following categories.

1. Large regional sites constructed either as shoreline extension or offshore islands.

2. Smaller shoreline extensions and nearshore sites further disaggregated into:

- a. Sites adjacent to publicly owned shoreline
- b. Sites adjacent to private or other public shoreline.

The identification and screening process for each group is described in more detail below.

Large Volume Regional Sites

During preparation of the Reconnaissance Report (January 1979) initial planning efforts concentrated on identifying large regional sites. Planning centered on finding either A) a single facility to receive all dredged material for the study area for the study period 1985 to 2035, or B) three facilities to receive all the dredged material with one facility to be located in each coastal area. Investigations were completed for capacities of 12, 30, 37, and 59 million cubic yards.

Considerations included three types of projects and siting zones: shoreline extension, nearshore islands, or offshore islands. Design details included using a circular configuration and containment by either rock dikes or steel sheet pilings.

Siting analyses, performed by a multidiscipline study team, included consideration of water depths, ecological factors, land use on adjacent shoreline, and wave and current energy regimes. Sites located and screened are listed in Table 5. The findings indicate that these large regional sites are costly to construct singularly (about \$150,000,000 to contain all material). Further, they would induce major impacts because of their structural magnitude. Further consideration was therefore deferred pending analysis of smaller sites. Subsequently, the more promising of these sites and areas were reevaluated for the Island/Shoal Screening Report.

Shoreline Extension/Nearshore Sites

Initial planning efforts described earlier evidenced that considerable potential existed for smaller local, and/or regional containment facilities, constructed as shoreline extension or nearshore sites. This next phase of the site screening process was carried forward for two groups namely publicly owned and privately owned shoreline.

Table 5

Sites Considered In Reconnaissance Study

Groton-Fisher Island
New London - Open Water Dump
Bartlett Reef - Offshore Waterford
Hatchett Reef - Offshore Old Lyme
Cornfield Shoals - Open Water Dump
Clinton - Six Mile Reef to Cornfield Shoals
Clinton - Six Mile Reef
Long Sand Shoal
Duck Island Lighthouse & Breakwater Offshore-Westbrook
Guilford - Falkner Island
New Haven - Tidal Flat E. Side of Hbr. Adjacent to E.
Shore Park
New Haven - Tidal Flat W. Side of Harbor Near Wharf
New Haven - Tidal Flat Breakwater Mouth of Old Field Creek &
Sandy Point Breakwater
New Haven - 20 Square Miles Near Historic Dump Site
Welches Point - West Haven
Charles Island - Offshore Milford
Milford Point - Milford
Point-No-Point - Stratford
Bridgeport Breakwater, W. Breakwater & Tongue Point
Pine Creek Point - Fairfield
Cockenoe Island - Norwalk Islands
Greens Ledge - Offshore Norwalk
Cable and Anchor Reef
Georges Rock
Stamford - Breakwaters to the Cows
Stamford - R32A Shoals
Goose Island - Offshore Greenwich
Little Captain Island - Offshore Greenwich
Area Outside Calf Island - Offshore Greenwich

Siting Method. The plan formulation presented in the Interim Report (July 1980) and the Addendum (January 1981) represents a preliminary siting analysis for shoreline extension containment opportunities for all of Long Island Sound. The four-step preliminary siting method includes:

1. Identify and rank primary screening criteria for selecting alternative sites.
2. Apply the criteria to Long Island Sound to obtain specific site alternatives.
3. Preliminarily rank the alternative sites in relative order of desirability.
4. Investigate the use of sites individually or in combinations to determine the potential of using more than one site.

Steps 1 and 2, by identifying the coastal areas of Long Island Sound showing the most promise for containment facility siting, served to greatly reduce the number of sites needing detailed investigation. Step 3 applied additional, but more specific, criteria. Step 4 formulated preliminary design of projects considering site specific issues, construction feasibility, operation, and other site specific factors. This site identification and screening process is outlined in more detail in table 6.

Publicly-Owned Shoreline Sites. The shoreline was screened for potential sites that were adjacent to publicly held shoreline at locations such as parks, beaches, transportation corridors and military and institutional sites. The incentive for these sites is that there are potentially fewer adverse impacts on residential and other private property, minimal land acquisition costs, and possibly less social/political opposition. The disadvantage is that, compared to privately owned shoreline on LIS, the public shoreline is severely limited in extent such that potential alternatives for consideration are in fact limited.

This primary screening siting process identified 133 public shoreline and existing disposal areas sited along the coast of LIS in New York and Connecticut. Of the 133 sites, 24 survived the initial screening (17 in NY and 7 in CT). Through the secondary screening process the number of sites was narrowed to eight (five in NY, three in CT). These are ranked in order as follows:

New York Sites

- | | |
|--------------------------------|------------------|
| 1. State Maritime Academy | Throgs Point |
| 2. Fort Totten/Little Bay Park | Willetts Point |
| 3. Garvies Point | Hampstead Harbor |
| 4. US Military Reservation | Hart Island |
| 5. Ferry Point Park | Upper East River |

Connecticut Sites

- | | |
|--------------------|------------------|
| 1. Bayview Park | New Haven Harbor |
| 2. Seaside Park | Bridgeport |
| 3. East Shore Park | New Haven |

After coordination of the findings with State officials, the top ranked sites were deemed to have unacceptable impacts.

Privately Owned (and other Public) Sites. Site screening was expanded to include potential containment sites adjacent to the private shoreline. The publicly owned shoreline as mentioned above was found to be too restrictive and bypassed opportunities for facility siting. This expansion offered advantages including: 1) it opened up a larger proportion of the shoreline for consideration, and 2) it allowed for more consideration

TABLE 6

SITE IDENTIFICATION AND SCREENING PROCEDURE

- Step 1. Identify and rank primary screening criteria
- 1) Bathymetry
 - 2) Shoreline Ownership
 - 3) Significant ecological areas
 - 4) Wetlands
 - 5) Major Public Beaches
 - 6) Wave Energy
 - 7) Land Use Compatibility/Reuse Potential
- Step 2. Apply the criteria to LIS. Working maps of LIS were first prepared. An overlay system was used to apply the various screening considerations.
- Step 3. Preliminary ranking of alternative sites to characterize the desirability of each site (Secondary screening). Step 3 used two distinct sets of numerical values: weighting factors and criteria points. Weighting factors are assigned according to the perceived importance of each factor. The criteria points represented the physical and geographic characteristics of alternative sites. See table 6 for work sheet. Criteria points were assigned based on site specific conditions. For instance if a site is located within 3 miles from shellfish beds (assigned 2 criteria points), it would have a lesser impact than if it were within 1 mile (zero points). These criteria points were multiplied by the weighting factors to establish an overall score. The greater the score, the lower the environmental impact.
- $(\text{criteria points}) \times (\text{weighting factor}) = \text{overall points}$
- Step 4. Investigate the use of sites individually or in combinations to determine the potential of using more than one site. Step 4 entailed preliminary design of projects considering site-specific issues, construction feasibility, and operational factors. The siting method was designed to produce a collection of potential sites for detailed review and evaluation. Reiteration of the first two or three steps was often necessary before the siting was completed.

SITE-SPECIFIC SECONDARY SCREENING CRITERIA

Siting Criteria

Name: _____ County: _____ Map # _____ Location# _____

1. Shorefront Ownership and Shorefront Disposal Sites

- a. Site Ownership: (Federal, State, County, Town, Private)

2. Proximity of Site to Significant Ecological Areas

- a. Shellfish Beds: _____ miles d. Waterfowl Areas: _____ miles
b. Lobster Locations: _____ miles e. Wetland Areas: _____ miles
c. Finfish Concentrations: _____ miles
f. Water Quality Conditions: poor/fair/good

3. Bathymetry

- a. Nearshore Slope: _____ ft/mile c. Available Volume Below MSL: _____
b. Available Surface Area: _____ acres _____ cu. yards

4. Exposure Considerations (within 1 mile either side of site)

- a. Wave Energy: (high, moderate, low)
b. Critical Erosion Areas: _____
c. Flood Zone Area: _____
d. Endangered Structures: (buildings, homes, jetties, etc.)
e. Cost of Flood Damages: (high/medium/low)

5. Soil/Foundation Characteristics

- a. Soil/Sediment Physical Characteristics: % sand, % clay, % silt
or USCS Classification: _____
b. Permeability: _____

6. Existing and Projected Land Use (within 1 mile radius of site)

- a. Residential: _____ % _____ % f. Public: _____ % _____ %
b. Recreational: _____ % _____ % g. Open Space: _____ % _____ %
c. Commercial: _____ % _____ % h. Agricultural: _____ % _____ %
d. Industrial: _____ % _____ %
e. Wetlands: _____ % _____ %

7. Volume and Types of Dredged Material Available for Containment

- a. Present Disposal Method: % Water (site), % Land (site)
b. Volume of Dredged Material Projected:
Within Quadrangle: _____ CY/year
Within Surrounding Quads: _____ CY/year
c. General Characteristics of Material (Phys-chem): _____

8. Compatibility with Adjacent Land/Re-use Potential

- a. Site Land use: (Res/Rec/Comm/Ind/Wetlands/Open Space)
b. Adjacent Land Use: (Res/Rec/Comm/Ind/Wetlands/Open Space)
c. Types of Industrial/Commercial Uses: (Port, sand/gravel, petroleum, etc.)
d. Access by Water: (channels, docking facilities)
e. Access by Land: (roads/bridges)
f. Area-wide Plan: (industrial/commercial expansion)
(need for recreation)
(market for re-use of dredged material)

9. Proximity to Cultural Resources

- a. Cultural: (closest) miles _____ (number) _____ 10 mile radius
b. Types: (historical, archaeological, etc.) _____

10. Existing and Historical Spoil Disposal Location

- a. Existence of Containment Structures, Dikes and Weirs:
(condition, dimensions)
b. Use of Material Previously Disposed: (construction fill, beach nourishment, etc.)
c. Volume of Material Previously Disposed: _____ CY

of reuseable containment facilities. This phase of the site screening is reported in an Addendum (January 1981) to the Interim Report mentioned above.

In this second group, an additional 121 sites were located and were grouped into the following categories:

18	Shallow Water Sites
31	Municipal Waste Water Treatment Plants
14	Power Generating Sites
21	Corps Navigation Projects, Jetties and Breakwaters
11	Industrial Wastewater Discharge
20	Petroleum Facilities
4	Sand and Gravel Pits
<u>2</u>	Other Sites
121	Total Sites

Of the 121 sites, nearly one half of the sites (54) were ruled out due to the lack of adequate construction space while eight were eliminated because of close proximity to public beaches. The remaining 59 sites that showed the most potential were subjected to secondary screening.

Results of the Site Identification and Screening Process.

The intent of the site identification and screening process was to locate where containment facilities using available resource information. Therefore, the process used various coastal resource maps, county maps, planning board maps, published reports and coordination with State and local officials.

This phase of the plan formulation process located 283 potential containment sites based on available resource information. A breakdown by type is as follows:

<u>Category</u>	<u>Total Number of Sites</u>	<u>Number of High Rankins</u>
Large volume regional sites	29	10
Public shoreline	133	24
Private and other public shoreline	121	59
	<u>283</u>	<u>93</u>

Based on criteria used, the screening process indicated that public sites and industrial sites generally offered the most potential whereas shallow water sites had the lowest overall ranking.

The screening analysis pointed to 83 shoreline and 10 offshore sites as scoring the highest in overall ranking. This list of sites, supplemented by public input, formed the basis from which sites were selected for further investigation.

SELECTION OF SITES FOR FURTHER INVESTIGATION

The site identification and screening process developed information and rankings on nearly 300 potential sites identifying the most promising sites as well as the least promising. The study moved on to actively involve the public in the identification of sites for further investigation. The three planning tools of coordination to select sites for further investigation were:

1. Review and coordination with State and federal officials
2. Review at public workshops
3. Coordination with local interests.

This was an important part of the plan formulation process inasmuch as it was through this coordination that public support or criticism of the sites was identified. This process also resulted in shifting the location of sites, or identifying entirely new sites which reflected local needs and knowledge of shoreline conditions. The public also expressed its opinion as to the value of impacted resources and the local need, or desire, for containment facilities.

State Coordination. The top ranked site groups were coordinated in each State with appropriate State officials. In New York, officials determined that all of the sites presented environmental conflicts, primarily because of the presence of shellfish stocks and tidal wetlands. In Connecticut, State officials also noted problems with some of the sites. However, while environmentally significant areas abound, it was acknowledged that not every foot of shoreline was critical in ecological significance. Based on this coordination and review, the sites located in New Haven Harbor were felt to result in unacceptable impacts to shellfish areas and were removed from further consideration.

Federal Coordination. The Corps has coordinated with other federal agencies through a series of meetings, workshops and distribution of reports. The U.S. Fish and Wildlife Service has played a particularly active role preparing reports under authority of the Fish and Wildlife Coordination Act. They have contributed planning aid letters in 1980, 1982 and 1984 and also a 1985 fish and wildlife report which is reprinted and attached to this report.

The Fish and Wildlife Service has been active in their support of the concept of containment for Long Island Sound, looking specifically for ways that dredged material can be used to benefit the environment.

Public Coordination. The public involvement proceeded along different avenues including correspondence, workshops, and numerous local meetings with towns, business and trade organizations. This process succeeded in a further screening of sites and identification of additional sites. A general observation of this process indicated that, with local

interest and support, potential containment facilities could be sited throughout the sound. Conversely, without local interest, it is improbable that any site could be advanced beyond general consideration.

Selected Sites

The coordination process resulted in 22 sites that were selected for individual investigation. These are described below and shown on figure 3. The sites were evaluated for technical feasibility and environmental, economic and social considerations. Information was obtained from previously prepared reports and input from individuals and agencies having knowledge of the area(s).

1. Captain Harbor, Greenwich, CT. Captain Harbor was the best site in western Long Island Sound of those proposed for review in this study. This site consists of an area of open water and islands about 1.25 miles offshore near Byram, Greenwich, and Cos Cob Harbors. This site is technically feasible, however, a lack of local support and opposition from coastal residents presently reduces the the incentive to pursue this site as a potential containment facility.

2. Norwalk Island, Norwalk and Westport, CT. is an area of open water and islands at the entrance to Norwalk harbor. Biological productivity, high concentrations of shellfish and finfish, along with the recreational land use patterns prompt rejection of this site for further consideration. In addition, navigational hazards could be increased by a containment facility in this busy boating area. Further, recently enacted barrier island protection legislation may bar construction of a containment facility in much of this archipelago.

3. Milford Point, Milford, CT. consists of a barrier beach and adjacent mudflat area located at the mouth of the Housatonic River on the eastern shore. The study area considered is located in a triangular shaped area between Milford Point on the northwest, the outer breakwater flasher to the south, and Laurel Beach to the east. This site is ruled out from further consideration by biological productivity, importance of wildlife habitat, and barrier island legislation recently enacted by Congress. Additionally, the U.S. Department of the Interior is pursuing acquisition of Milford Point and it is expected that this area will become part of the Connecticut Coastal Wildlife Refuge System.

4. Thimble Islands, Branford, CT. is an open water and rocky island archipelago located to the east of Branford Harbor and west of Sachem Head. More than a dozen sizable islands make up "The Thimbles." Although technically feasible, public comment received reflects strong community opposition which renders utilization of this area impractical as a containment facility site. Biological productivity, shellfish concentration, finfish concentrations, surrounding land use patterns and navigational hazards are among the factors supporting elimination of this location from further consideration.

5. Falkner Island, off Guilford, CT. is an area located approximately 3 nautical miles south of the entrance to Guilford Harbor. The site consists of two major islands, Falkner and Goose Island and several rock outcroppings. This site, although technically feasible, has several environmental issues including the loss of rock and bottom habitat and the need for undisturbed shorebird nesting, especially for the tern. The site is located in a high energy zone which would entail a large and costly containment structure. In 1984, the Falkner Islands were designated as a National Wildlife Refuge area. On this basis the site was eliminated from further consideration.

6. Sixmile Reef, off Clinton, CT. is a shoal area located approximately 3 nautical miles south of Hammonasset Point. This site was rejected from consideration due to high biological productivity, the potential for creating a navigational hazard, and high costs related to construction in deep water.

7. Duck Island Roads, Clinton and Westbrook, CT. is a harbor of refuge formed by 3 breakwaters constructed in 1917 by the Corps of Engineers. A containment proposal here could be located on the western edge of the harbor and not impact on it. This site is designated as warranting further investigation with future studies addressing environmental impacts, shoreline erosion and design considerations. However, because of concerns of nearby residents and the lack of local support, further consideration was deferred.

8. Menunketesuck Island, Westbrook, CT. lying due east of Duck Island Roads, is a slender island with associated sand flats extending southwest from the entrance of the Patchogue River. Limitation on size and capacity combined with disruption of habitat utilized by shorebirds rule out further consideration of this site. High biological productivity, significant shellfish concentrations, and proximity to municipal beaches further support its elimination.

9. Bartlett Reef, off Waterford, CT. represents an area of shoals located south of Seaside Point, east of Niantic Bay and west of New London Harbor. A few rock outcroppings of the reef are visible at low tide though the majority of the reef lies 2-12 feet below low tide. High biological productivity, potential for creating navigational hazards, strong currents and a significant potential for erosion combine to make this location undesirable for further consideration.

10. Stratford Shoals, off Stratford, CT. is a shoal area located midway between Stratford Point and Crane Neck on Long Island. Initial analysis indicates that this site is an important lobstering area and a popular fishing area. It also a high wave energy zone requiring costly containment dikes, with adverse environmental impacts and no public sponsorship, this site was not advanced for further study.

11. Black Ledge, Groton/New London, CT. is located about 1 mile outside the entrance to New London Harbor. The site, originally considered by the U.S. Navy, was recommended for further consideration by the city of Groton Conservation Commission and Harbor Study Commission. With a capacity of 7.5 million cubic yards the site could serve as a regional disposal area and was advanced for detailed investigation. Site conditions established during detailed studies included high wave energy and water depths to 35 feet. The resultant \$40 million cost make the facility economically infeasible.

12. The Clinton Harbor, CT. site is located in Clinton and Madison in the outer harbor area. The facility is planned as a marsh creation site adjacent to the present wetland area on Hammonasset State Park. The site has support from town and business interests in Clinton and was advanced for detailed investigation.

Subsequent detailed studies indicated that the site showed economic feasibility, but three events impacted on the feasibility of the project:

1. the town of Madison surfaced aquaculture plans that they had prepared for the area.
2. the state of Connecticut raised several environment issues regarding the proposal, and
3. the containment site was in an area designated as coastal barrier beach.

13. Fayerweathers Island, Bridgeport, CT. is located between Bridgeport Harbor and Black Rock Harbor. The facility would have a capacity of 1.4 million cubic yards. The site would result in significant impacts to a seed oyster cultivation area. Opposition to the site was very strong from abutters west of Black Rock Harbor, and the site was eliminated from further consideration.

14. Yellow Mill Channel, Bridgeport, CT is a 16.5 acre site on the upper reaches of the channel with a capacity of 136,000 cubic yards. The proposed site would be filled in 1 to 2 years, and, after capping with clean fill could be turned into a recreation area. Plans were underway to expand the wharf of Jacob Brothers Scrap Iron further upstream, significantly reducing the area which could be used as a containment facility. Also, city officials indicated that they preferred to use the channel as a spoil site for refuse. Following these discussions with city officials, this site was ruled out.

15. Two Tree Island is a submerged rock outcropping located about 1 mile off Millstone Point in Waterford, CT. This privately-owned island is presently a natural waterfowl refuge and is surrounded by significant shellfish and finfish habitat. An 80-acre containment facility could provide capacity for 3.4 million cubic yards of dredged material. Local

conservationists envisioned this as a future wildlife area. However, use of the site was strongly opposed by the owner and the Millstone nuclear powerplant owners who felt that the facility may interfere with the intake of cooling water needed for the plant's operation. Also it was felt that nearby Black Ledge was a better site so further study at this site was deferred.

16. Borrow Pits in LIS (Sherwood Island, Morris Cove, and Prospect Beach). These sites were recommended by the Connecticut Division of Aquaculture which proposed the filling of these aqueous borrow pits. The Sherwood Island site was studied in detail as the representative of this type of disposal area.

17. Mamaroneck Harbor, NY. There are actually three alternative sites in this harbor area that were recommended for consideration by local interests. A facility at the primary location could hold about 500,000 cubic yards of dredged material. All are located in a highly sensitive shoal area in an area of extensively developed shoreline. All three were rejected for environmental and social reasons.

18. Gold Star Bridge, New London, CT. This site is located on the Thames River immediately upstream of the Gold Star Bridge at I-95. The site, recommended by the Connecticut Department of Transportation, is located adjacent to dredging operations, is protected from high waves, and adjoins State-owned land. However, the site was rejected following geological screening which indicated very poor foundation conditions.

19. Penfield Reef, Fairfield, CT. This potential site for a containment facility was recommended as a shoreline extension facility with a capacity ranging from 1 to 4 million cubic yards. At the smaller size, the facility would receive dredged material from Black Rock Harbor. If developed as a larger facility, it could function as a regional containment facility. Accordingly this site was advanced for further study.

During detailed studies, the site drew considerable support from the town of Fairfield Conservation Commission, in part because of its potential to reduce tidal flooding and wave damage and to reverse shoreline erosion processes. However, the site is not cost effective and could impact negatively on this environmentally sensitive area.

20. Mianus River, Greenwich, CT. This site, located on the Mianus River, was viewed as a local disposal site. However, because of infrequent dredging and limited dredging material volume, it was eliminated from further consideration.

21. Milford Harbor, Milford, CT. The site would be located just outside Milford Harbor adjacent to the Federal channel. The facility, with a capacity up to 400,000 cubic yards, was recommended by the Milford

Harbor Commission and received further detail study. A facility at Milford would fit into the town's harbor plans, impede erosion along the town beach and meet their disposal needs for up to 50 years. However, cost estimates indicate that the \$2.6 million structure would not be cost effective.

22. Flushing Bay, New York, NY. This site was recommended by the New York-New Jersey Port Authority and is actually located out of the study area on the East River. The New York District of the Corps of Engineers is continuing investigation of the potential for creating a small marsh restoration project at this location. Therefore, no further consideration was given to the site in this study.

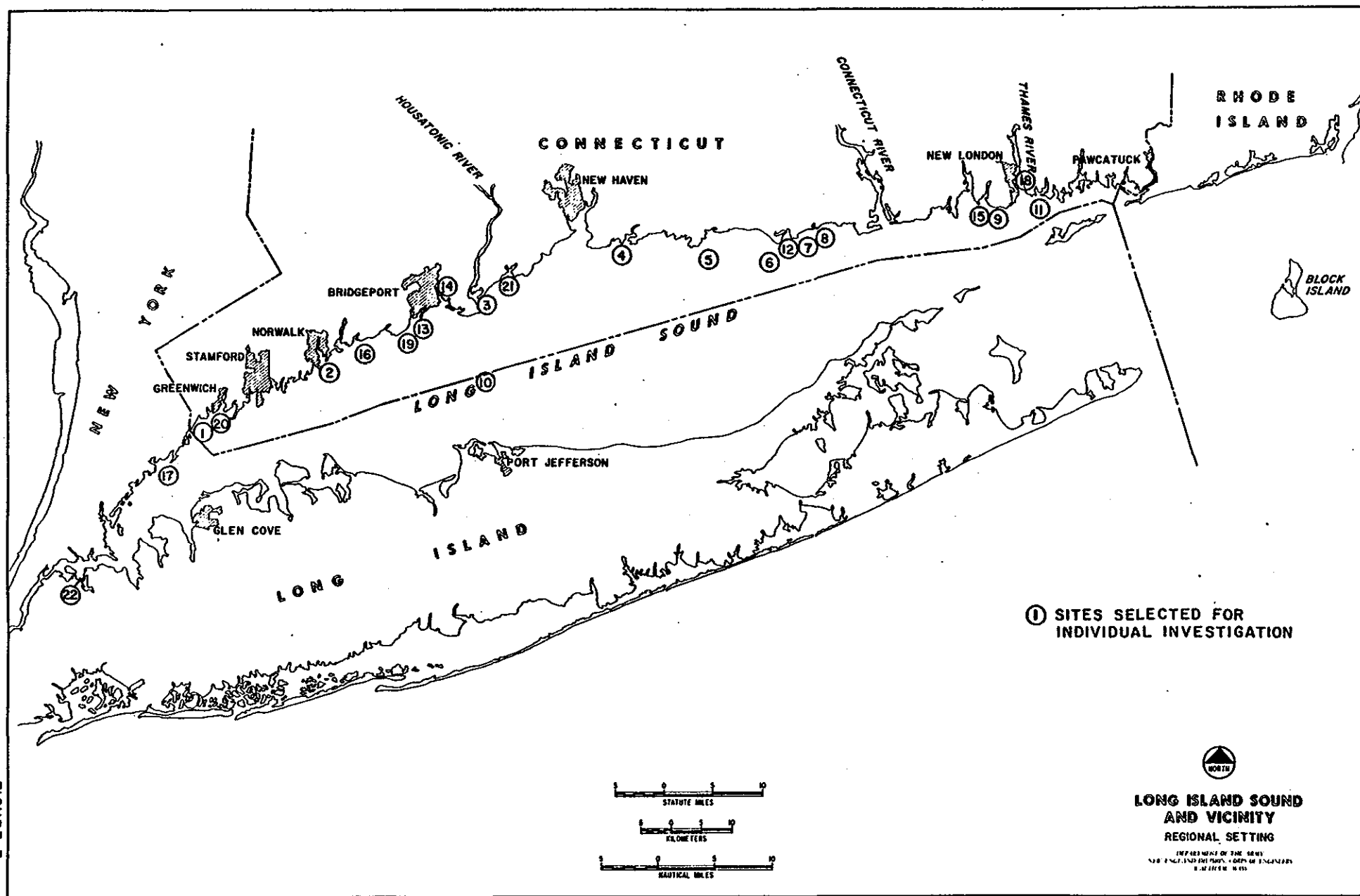
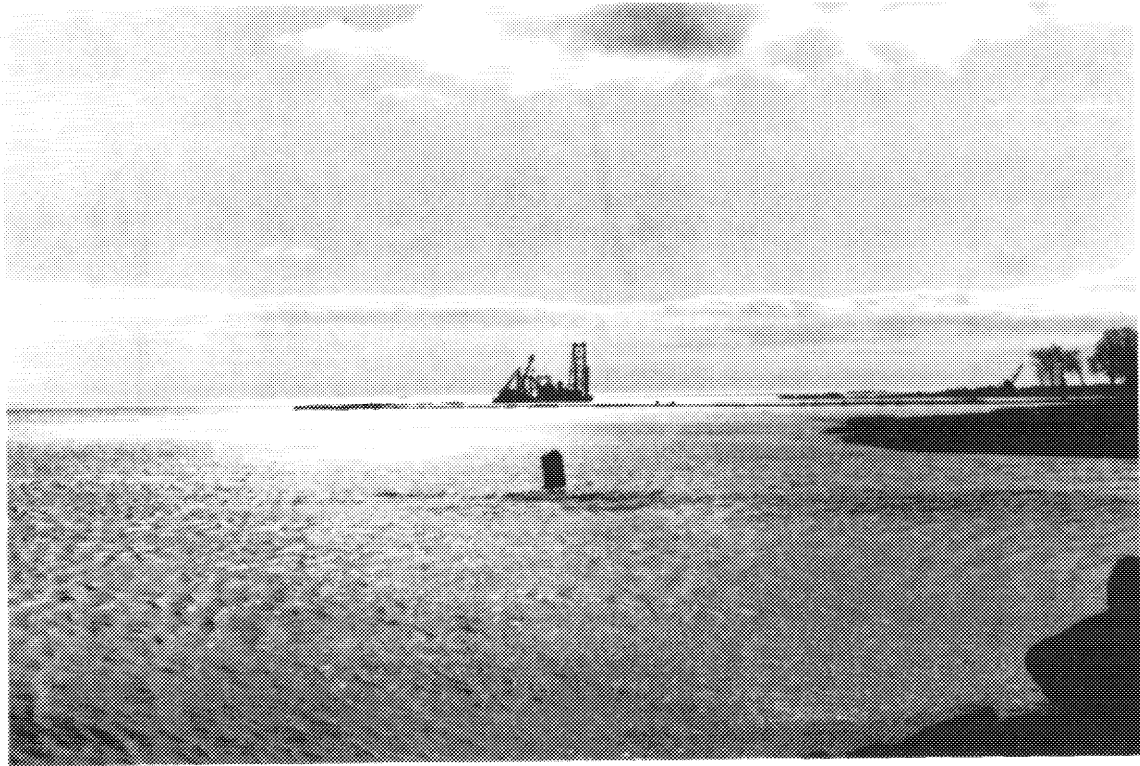
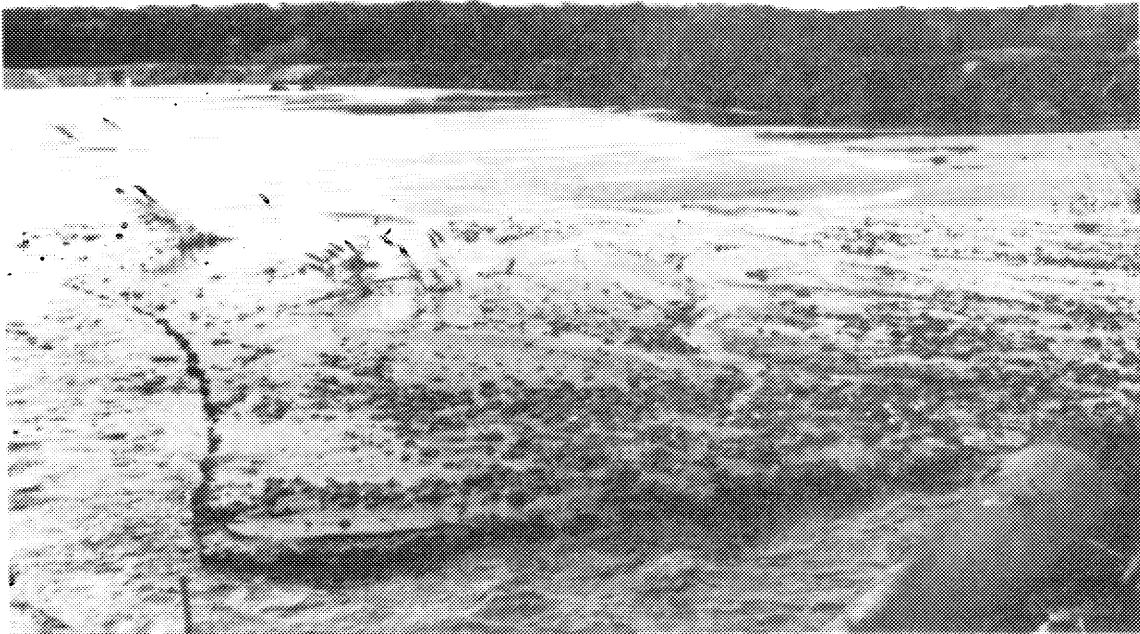


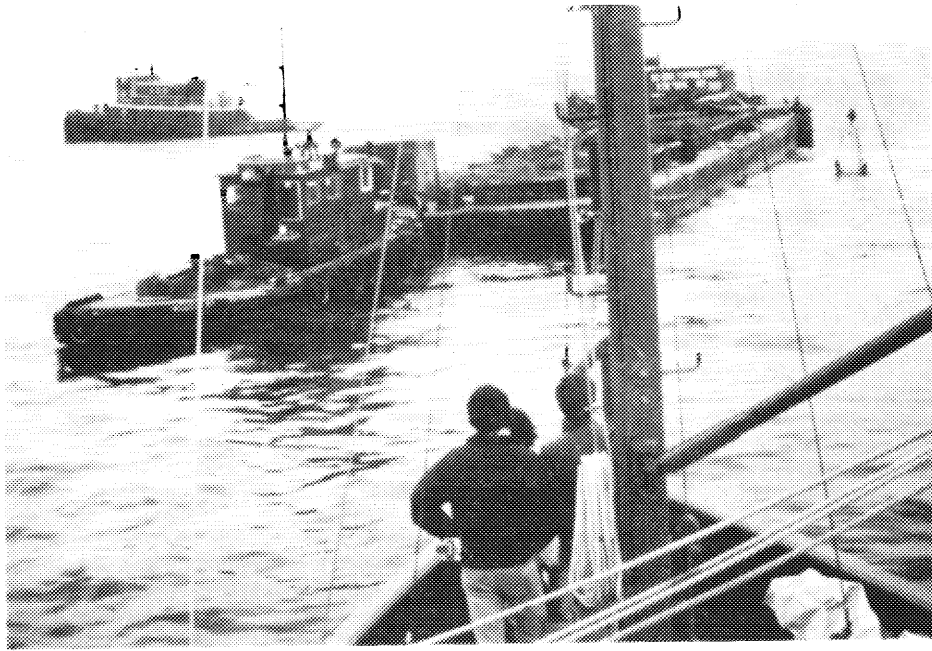
FIGURE 3



Dredging operations are an essential part of keeping LIS harbors, such as at Guilford, CT shown here, open to boating traffic.



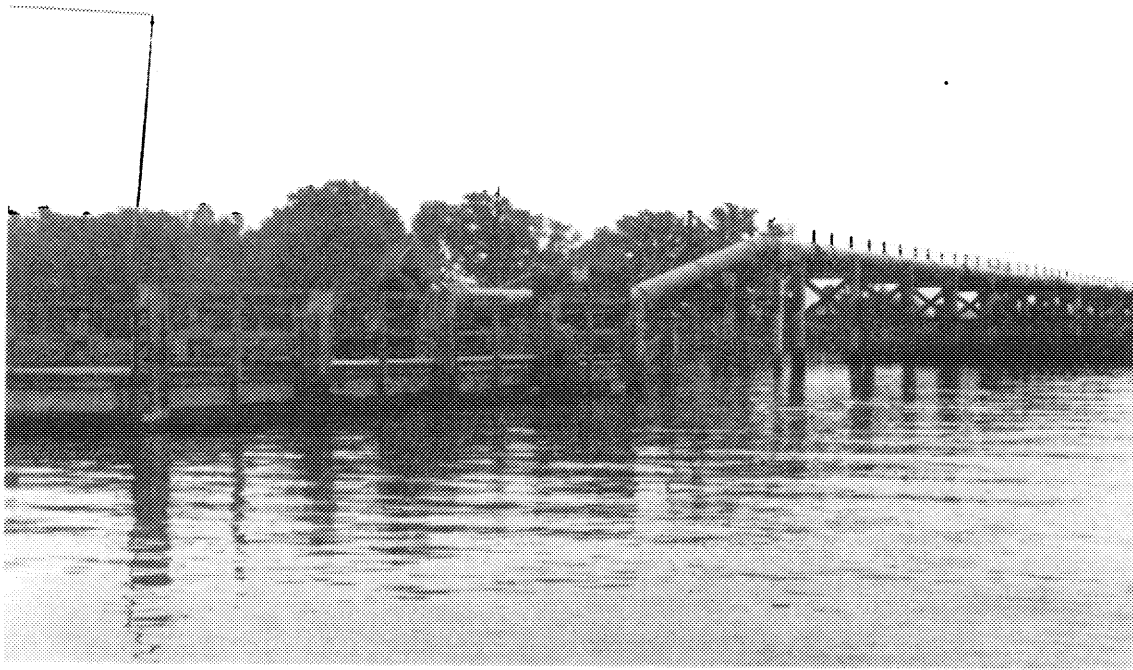
Land disposal containment sites such as this Guilford, CT site are becoming less available because existing sites are filling up or because of regulatory controls.



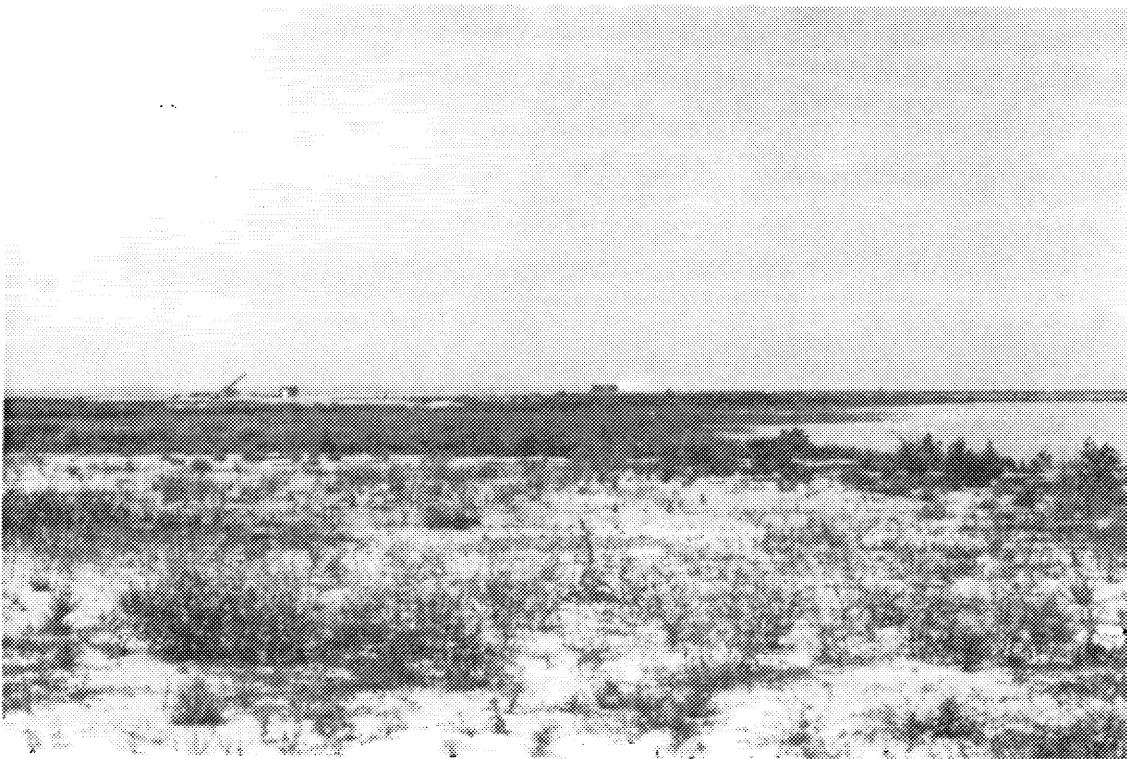
The majority of dredged material from LIS harbors is disposed of at open water sites. Short and long-range impacts are closely monitored by the DAMOS program conducted by the New England Division.



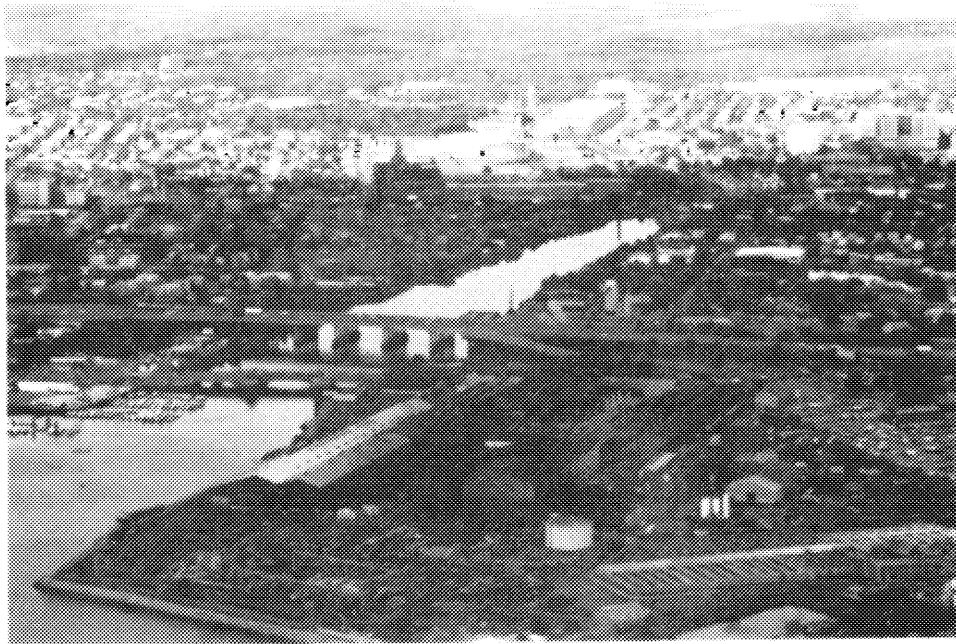
The Corps is continuing research into the effects of alternative disposal techniques. Here the Corps constructed a wetland containment facility for field testing.



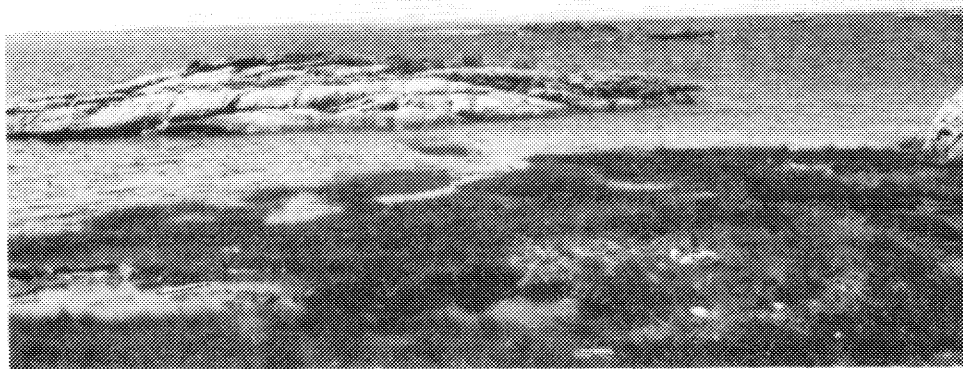
While the use of containment is not common in LIS it has seen widespread use in other parts of the country as evidenced by this dredge mooring and rehandling facility at Dickinson Island in the Great Lakes.



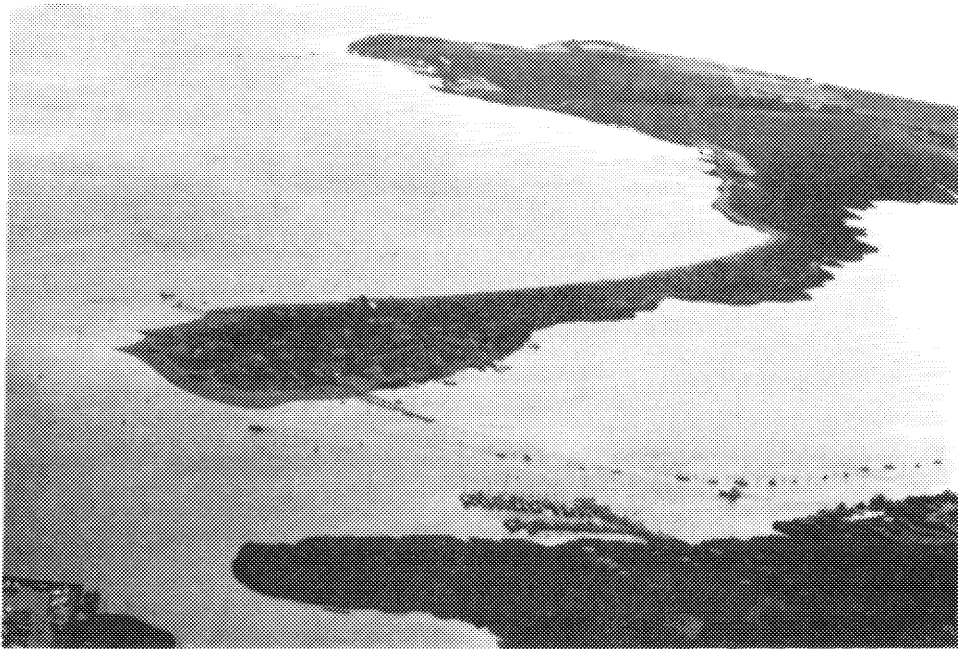
In the Great Lakes, the use of containment has been mandated in the short term to prevent further dumping of contaminated materials in open water. Shown here is a containment facility at Point Mouillee.



Over 300 potential containment sites were identified in LIS such as this site in Yellow Mill Creek in Bridgeport, CT. Very few sites received local support.



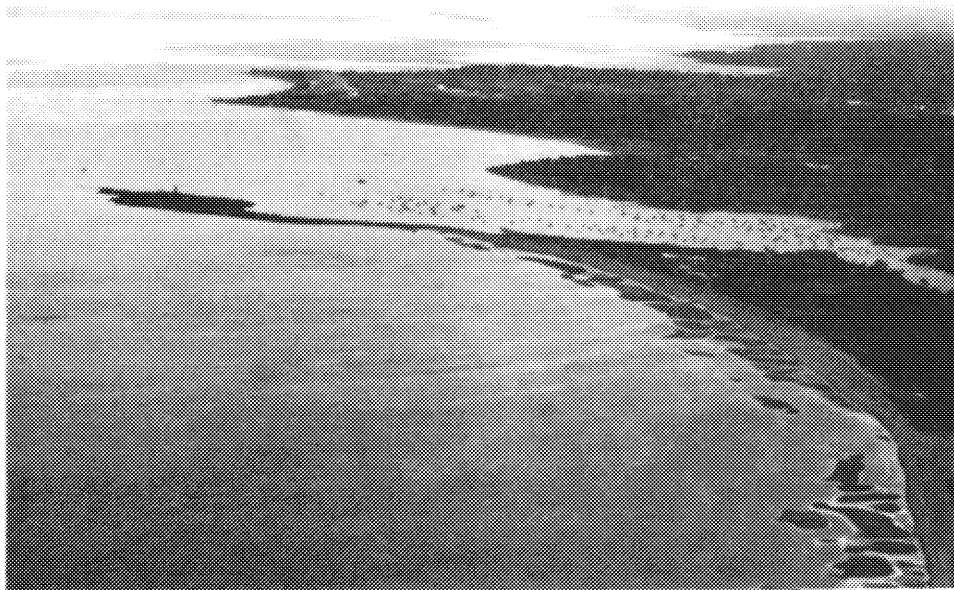
Many potential sites, such as this one at Scotch Caps in Mamaroneck, NY were sited adjacent to harbors. In this instance, as well as many others, local interest cited unacceptable environmental impacts.



Clinton Harbor interests were supportive of constructing a containment facility in the outer harbor area adjacent to the federal channel and private marinas.



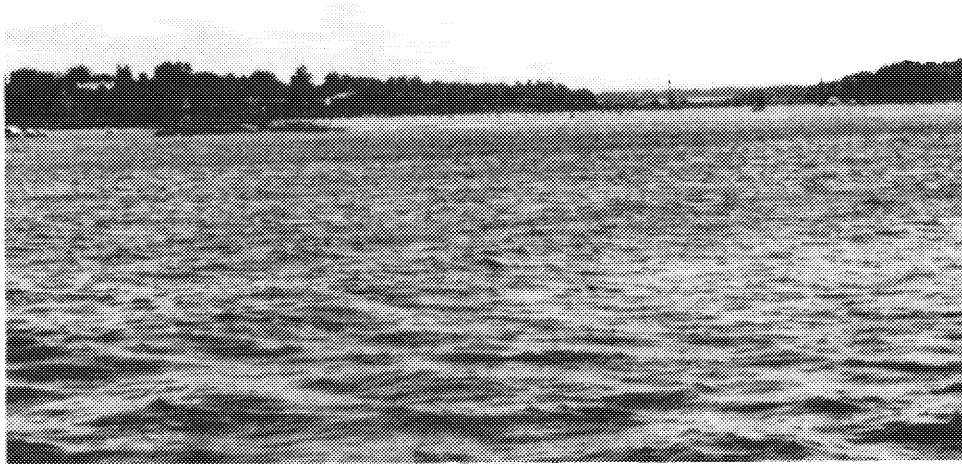
The facility at Clinton would be vegetated and function as a wetland similar to this area in the Great Lakes.



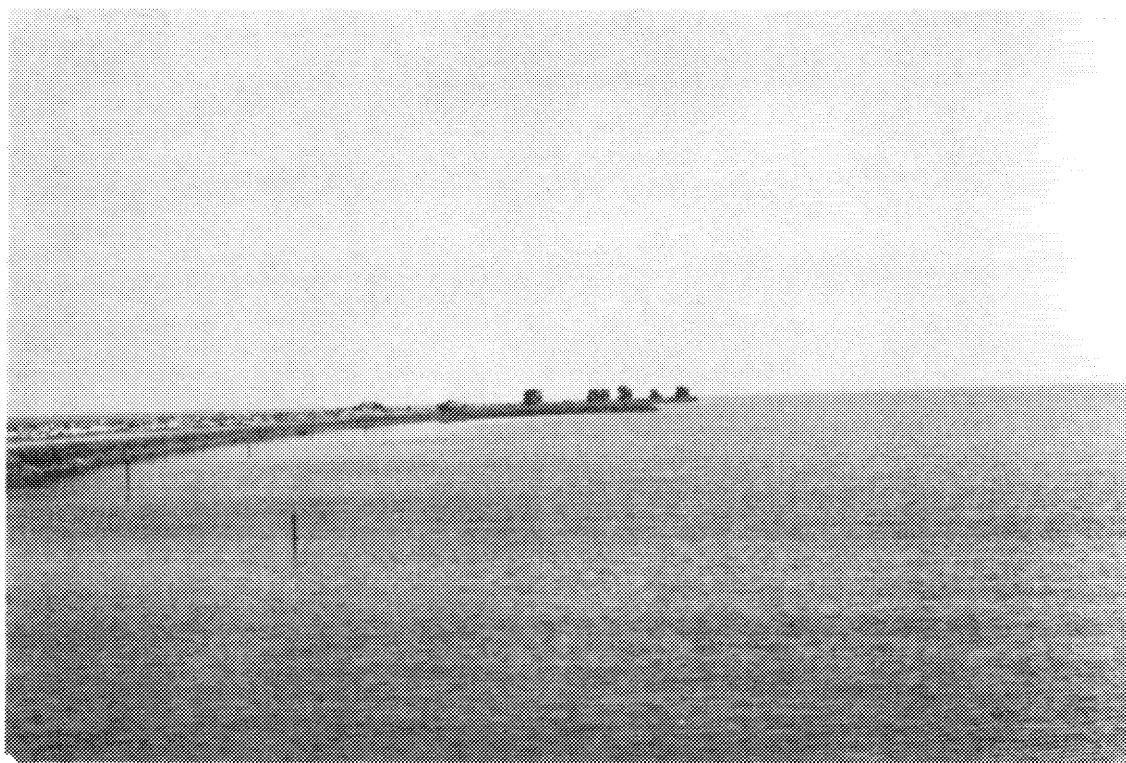
A containment facility at Penfield Reef (in background) in Fairfield, CT was considered as a potential disposal area for Black Rock and other harbors.



Much of the LIS coastline is developed and many areas such as this residential area adjacent to Penfield Reef would be directly impacted by a shoreline extension containment facility.



Town interest led to consideration of a containment facility at the Milford Harbor entrance. A facility here could be incorporated into the town's recreation area and prevent erosion to Gulf Beach.



The Milford site, as well as others, were planned as shoreline extension sites. Containment dikes would be constructed of rock and gravel from material hauled by trucks as seen here at Point Mouillee.

PROTOTYPE

SITES

DETAILED ANALYSIS OF PROTOTYPE SITES

Detailed analysis were designed to generate the information needed to assist in making the determination of the feasibility of containment facilities in Long Island Sound.

Public participation played an important role in adapting plans to meet local conditions and desires as well as gaging the level of local interest.

The plan formulation process, which included site identification, site screening, and public review and recommendations, produced five potential containment sites, which represented different categories of sites, had public interest and support and warranted further analysis. The five sites which were advanced for more detail analysis to test the feasibility of these individual prototype sites are:

- | | | |
|-----------------|---|---|
| Clinton Harbor | - | Marsh creation site. |
| Black Ledge | - | Island creation site for use as a regional disposal area. |
| Milford Harbor | - | Shoreline extension site for use by local harbor. |
| Penfield Reef | - | Shoreline extension site for use as a regional disposal area. |
| Sherwood "Hole" | - | Aqueous borrow pit. |

Methodology. The detailed analysis allowed a closer look at the engineering design, environmental resources and impacts, project economics, wave energy and sediment transport, and socio-economic considerations.

Engineering studies for individual sites included site geology, foundation conditions (determined by field investigations and laboratory analysis), hydrographic surveys, construction considerations and tidal hydraulics.

Environmental considerations were based on LIS resource reports and field surveys including benthic sampling, diver observations and laboratory analysis. In addition, oceanographic observations and computer modeling for wave energy analysis and sediment transport were undertaken at the Clinton, Black Ledge and Penfield sites.

Economic analysis were aimed at comparing the costs of disposal at each containment site with open water in LIS and open water ocean disposal at The Race (located at the eastern end of the sound). The major factors affecting dredging and disposal costs were assumed to be transport distance, type of dredging operation and project size. These added

dredging costs were added to mobilization costs and, in the case of containment, the cost of the facility. First costs were amortized at 8-3/8 percent Federal discount rate for the expected time to fill the facility - generally 25 years.

Social considerations of the acceptability and possible impacts associated with containment facilities were based on literature research, site visits, the public workshop and research interviews.

CLINTON HARBOR DREDGED MATERIAL CONTAINMENT FACILITY

Background.

Clinton Harbor, located in the Connecticut towns of Clinton and Madison, is formed between Hammonasset and Kelsey Points by two headlands projecting into Long Island Sound (LIS). The Cedar Island Peninsula divides the harbor into "inner" and "outer segments. The harbor is one of the main recreational boating harbors on LIS, accommodating 15 marinas and town docking facilities. It is served by a Federal navigation project consisting of a channel 8 feet deep at mean low water (mlw), 100 feet wide and 1.1 miles in length, and an 8-foot deep anchorage area. The Corps of Engineers completed the project in January 1951 and performed maintenance dredging in 1958, 1965, 1973, 1976, 1981, 1982 and 1984.

Recent changes in dredge material disposal options have affected Clinton Harbor. Historical disposal locations included wetlands in the harbor area and use as construction material in Hammonasset State Park. Because site capacities have been reached or wetland policies have curtailed use, neither of these options presently exist in this area. The historic dumping ground located about 2 miles offshore is also closed. Disposal options now include open water sites at Cornfield Shoals (8 miles away) or New Haven (25 miles away) as identified in the Interim Plan for the Disposal of Dredged Material from Long Island Sound. Most material dredged from Clinton is taken to Cornfield Shoals, which limits disposal to "clean" material. There are, however, inner harbor sediments that would not meet the criteria and would have to go to New Haven disposal area - a costly alternative. This could directly affect consideration of any further navigation improvements which may be desired by the town.

Small private marinas and dredgers are the group most severely impacted by the changes in disposal patterns. They are unable to rely on the economies of scale that would be needed to offset increased hauling costs. Faced with these recently increased costs and the potential for further restrictions and cost increases, harbor interests have identified the potential for a dredged material containment site which would be located in the outer harbor area adjacent to Hammonasset State Park, and immediately west of the Federal channel.

Site Description

The containment facility site is located in the outer harbor area as shown in Figure 4. The topography of the area is generally flat and located adjacent to extensive wetland areas which are part of Hammonasset State Park. Offshore, the area is generally flat with boulders providing some relief. Minimum offshore elevation at the site is about -8 feet NGVD (-6 MLW). Glacial deposits are dominant in the offshore area with overburden thickness of about 50 feet over igneous bedrock. The surficial deposits consist of granular soil overlying very soft organic silt.

Project Formulation

The containment facility is being considered as a disposal area only for dredged material that would come from Clinton Harbor. The facility is adjacent to present and prospective future dredging areas. As such, hydraulic dredging operations with direct pipeline to the disposal area will be possible. Material from other harbors is not being considered for disposal at Clinton.

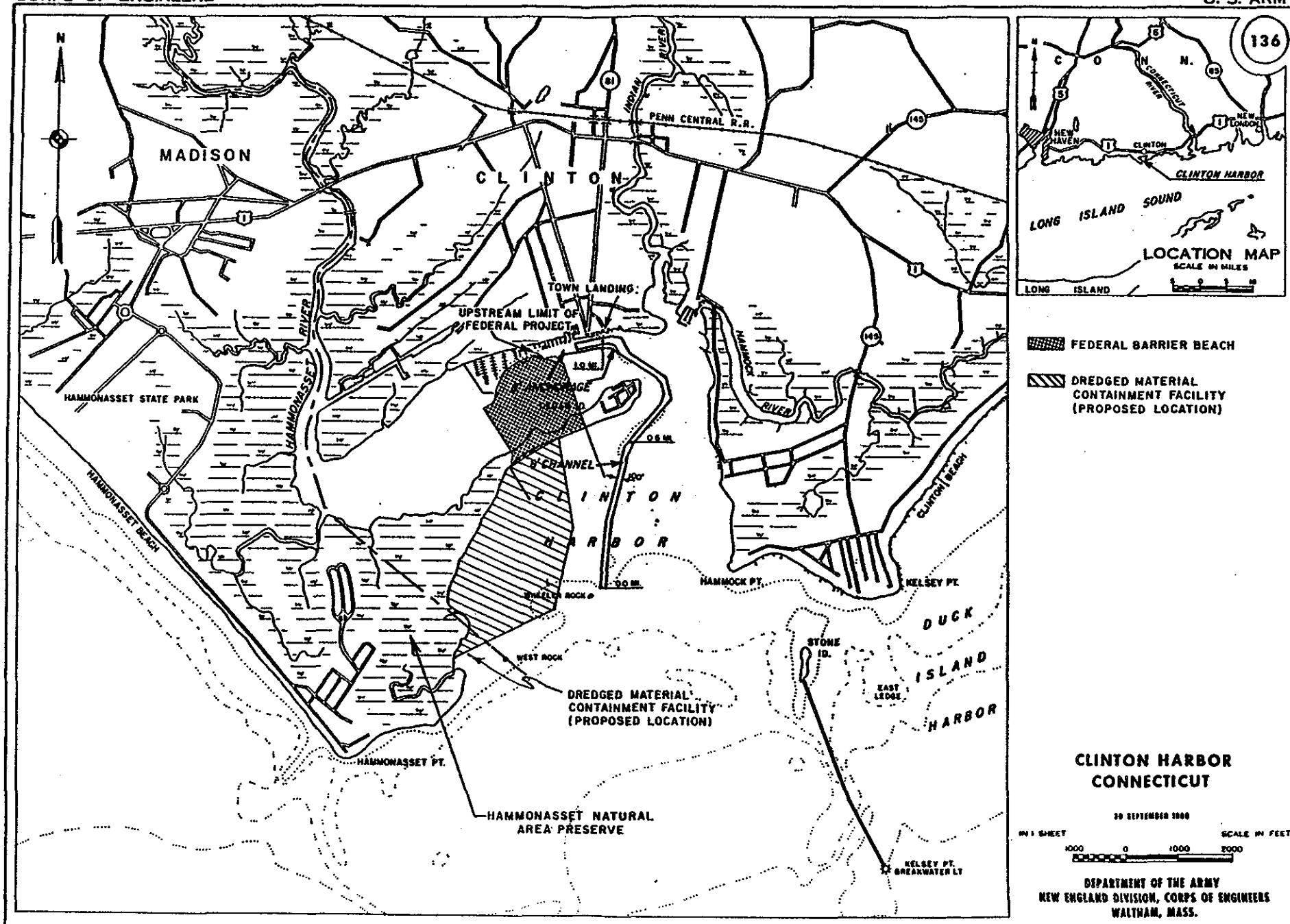
The containment facility is sized with a capacity to store up to 1 million cubic yards of dredged material (see Table 7). Under the Most Probable Future scenario, the facility would have a useful life in excess of 25 years. Alternatively, a smaller facility with a capacity of 500,000 cubic yards was also considered and would be appropriate for minimum growth or other possible scenarios that might consider the use of the containment facility and Cornfield Shoals for future disposal areas.

Table 7

Dredged Material Disposal Needs - Clinton Harbor (Cubic Yards)

Type of Dredging	Most Probable Future	Min. Growth
Federal O&M	105,000 (4200/yr)	90,000 (3600/yr)
Permit	500,000 (20,000/yr)	250,000 (10,000/yr)
Improvement Dredging ¹	150,000	150,000
Total	755,000	490,000

¹ Assumes modification/extension of existing Federal project.



The Clinton project, although referred to as a containment facility, is being planned as a marsh creation project. As such, tidal circulation over the marsh and dredged material is necessary for the facility to function as a wetland area. Planning and design reflect attempts to contain the material in a facility that will blend favorably with the existing wetland area on Hammonasset Park. Retaining dikes would be built to help protect the existing and newly created marsh. Their final elevation would be +6 mean low water, or an elevation which corresponds to the various naturally occurring rock formations along the shoreline at the site where the facility would tie into high ground. In addition, there are numerous boulders located in the water which form a relatively straight alignment (out towards Wheeler Rock). They, too are in the +4 to +6 mean low water range and could easily blend in as part of the retaining dike system.

Design Consideration

Facility designs were based on project formulation concepts, foundation soils and hydrologic conditions. Foundation soils, as determined by subsurface exploration and laboratory analyses, are highly compressible and limit the elevation of the dike to approximately 6 feet above mean low water (+6 MLW). The top of the dike elevation coincides with the elevation of natural rock features in the area where the facility ties into high ground. At this elevation, tides and waves would frequently overtop the dike and flood the containment area.

The proposed dike would be constructed of rock and gravel in zero to 8 feet of water. These water depths are too shallow to allow any significant placement by barge. The most economical construction method would be to truck the material from local land sources and spread the material from the shore outward using bulldozers.

The dike would be approximately 4800 feet long with a maximum height of 12 feet at the point of maximum water depth. The dike core would consist of quarry spalls sized up to 400 pounds, a size that would be strong enough to support construction equipment and be heavy enough to resist erosion during construction. Armor stone - slope protection is required on the ocean side of the dike to protect the structure from design wave heights of 4 to 6 feet. This rock slope protection would extend over the top of the dike and would require stone sizes up to 1,500 pounds. A gravel blanket, and, if found necessary, a filter fabric would be placed on the inside of the dike to retain dredged material fines within the facility. Based on preliminary estimates the following quantities of material are needed, which are expected to be available from commercial sources within 30 miles of the site.

Table 8

Construction Materials - Clinton

<u>Material</u>	<u>Quantity, cy</u>
1,000 - 1,500 lb. Armor Stone	13,100
200 - 400 lb. Armor Stone	4,900
1 - 150 lb. Quarry Chips	44,750
Gravel (Bank Run)	3,000

A weir structure approximately 50 feet wide would be required to control circulation in and out of the 100-acre containment facility.

Dredging would be a hydraulic operation with the material pumped directly into the facility. As the dredged material is deposited within the retaining dikes, the elevations of the "mounds" would be carefully observed. The high points would be approximately +7 mean low water while the low points would be submerged at mean low water. This would produce a landscape similar in appearance to the adjacent existing marsh. The marsh creation project would not interfere with the existing marsh, reduce its present size, nor create any undue stress upon it. Rather it would help protect portions (the westernmost area) which are presently subject to slight erosion. When filled to capacity, about 55 acres of Spartina alterniflora marsh would be created on fine gravel materials at elevations between 4 and 5 feet mean low water. Thirteen acres of S. alterniflora would be developed in the predominantly sand structures adjacent to the retaining dikes at elevations between 2.5 and 5 feet mean low water.

Economic Analysis

The economic analysis for Clinton Harbor considered dredging and disposal costs for four alternatives disposal sites: the containment facility, Cornfield Shoals, New Haven and The Race. Two levels of dredging activity, which corresponds to most Probable Future and Minimum Growth scenarios were evaluated. Factors used to evaluate the economics included first costs (containment facility), mobilization and demobilization costs, and dredging costs which are specifically affected by type of dredged plant to be used, project size and transport distance. Hydraulic dredging was assumed for disposal at the containment facility, while a bucket/scow operation was assumed for other disposal alternatives. The costs for each alternative are shown in Table 9.

Table 9

Clinton Harbor Containment Facility
Costs by Alternative

<u>Disposal Site</u>	<u>Dredged Material Quantity</u>	
	<u>1 MCY</u>	<u>0.5 MCY</u>
<u>Containment Facility</u>		
First Cost ^{1/}		
Dike	\$1,347,000	\$ 700,000
Wetland Planting	80,000	60,000
Contingency (25%)	357,000	190,000
Subtotal	\$1,784,000	\$ 950,000
Engineering & Design	71,000	38,000
Supervisions & Administration	107,000	57,000
Total	\$1,962,000	\$1,045,000
Annual Cost ^{2/}		
Facility	\$ 190,000	\$ 101,000
Mobilization & Demobilization	69,000	69,000
Dredging	284,000	139,000
Total	\$ 543,000	\$ 309,000
<u>New Haven Dump Site</u>		
First Cost	--	--
Mobilization & Demobilization	\$ 93,000	\$ 93,000
Dredging	487,000	238,000
Total	\$ 580,000	\$ 331,000
<u>The Race Dump Site</u>		
First Cost	--	--
Mobilization & Demobilization	\$ 93,000	\$ 93,000
Dredging	528,000	257,000
Total	\$ 621,000	\$ 350,000
<u>Cornfield Shoals</u>		
First Cost	--	--
Mobilization & Demobilization	\$ 93,000	\$ 93,000
Dredging	406,000	203,000
Total	\$ 499,000	\$ 296,000

^{1/}1984 Costs

^{2/}Amortized at 8-3/8% for 25 years.

Results. The economic analysis indicates that disposal at the containment facility would be about 9 percent more costly than disposal at Cornfield Shoals; but 7 percent less costly than disposal at New Haven. In effect, the containment facility option is economically competitive with open water disposal because of substantial cost savings associated with hydraulic dredging techniques which offset the first costs of containment.

Socioeconomic Impacts

The socioeconomic impacts of the marsh creation project are summarized below:

- Creation of additional new marsh using dredged material adjacent to an existing but eroding marsh is viewed as a net benefit to the area. This conclusion is based on expressed desires to protect the existing marsh and to add to wildlife habitat in the area.

- The site is relatively distant from residential areas so that potential aesthetic impacts, such as odors and noise, would be small.

- There is potential for increasing existing vector problems. Mitigation measures should be considered if found necessary.

Environmental Considerations

Environmental considerations for Clinton Harbor are based upon information contained in the report entitled, "Environmental Baseline Data Collections and Site Evaluations - Long Island Sound Container Disposal Study Clinton Harbor, Connecticut" prepared in March, 1983 as part of this study. The inshore area, where the proposed containment area would be located, is subject to chronic physical disturbance, therefore the benthic community is reduced in terms of low richness and density. A September and October sampling program in 1981 indicates that the area is occupied by a community different from that found offshore; species which were common at the inshore location tended to be absent from offshore. The community that occupied this area was closely related to that seen in the shallow subtidal zone, but also contained species generally seen further offshore.

No shellfish were found in any of the subtidal samples. But, Mercenaria mercenaria (hard-shell clam) and Aequipecten irradians (bay scallop) do exist in the area. A local population of Crassostrea virginica (oyster) exists in the intertidal zone at Hammonasset State Park. An insignificant population of Mya arenaria (softshell-clam) is present intertidally.

Only fifteen finfish species were collected during this study with Pseudopleuronectes americanus (winter flounder), Paralichthys dentatus (summer flounder), and Menidia menidia (silverside) the dominant three species. No algae species were found; the soft bottom habitat at the proposed containment area is unsuitable for algae colonization.

In addition to the summer migrations of Pomatomus saltatrix (bluefish) and those collected during the September and October sampling periods, the following marine species are common to the Clinton Harbor area: Morone saxatilis (striped bass), M americana (white perch), Stenotomus chrysops (porgy), Brevoortia tyrannus (menhaden), Callinectes sapidus (blue crab), and Mytilus edulis (mussel). (Deleuw et al. 1981).

The proposed containment area has a high potential for biological enhancement of the existing intertidal shores. The proposed dredge disposal areas could be designed and managed to provide for expanded areas of saltmarsh habitat. Both high and low saltmarsh habitat could be created with protected shallow water areas for fish nursery areas. In addition, the containment would be designed to confine any pollutants present in the dredged material.

Limited mathematical modeling has indicated that placement of a containment facility may restrict tidal flows more toward the eastern portion of the Middle Harbor as well as modify wave refraction/-diffraction and increase peak velocities (2 to 3 times) in that area. These flow modifications may change bottom and shore topography which could alter the benthic communities. The sediment profile photogrammetry shows rippled bottom generated by unidirectional tidal flow. Net average velocities were from 36 to 63 cm/sec.

The potential impacts of locating a containment area in western Clinton Harbor would consist of the following: loss of approximately 100 acres of existing benthic habitat (approximately 145 species and 5,000 to 13,000 individuals per square meter); changes in water circulation patterns, changes in topography due to displacement of currents; and visual aesthetics would change from open water to salt marsh and breakwater.

For the purpose of shellfish control, the containment area is under the jurisdiction of the town of Madison. The Madison Shellfish Commission, which opposes the containment facility, has developed a management plan for aquaculture, shellfish transplanting and cultivation and recreational shellfishing.

As presently considered, the marsh development should be predominately planted with Spartina alterniflora and S pattens marsh. High elevations should be planted with Panicum virgatum and Ammorphilia breviligulata. The dike would present a rocky habitat suitable for colonization by attachment organisms.

The Hammonasset State Park on the western boundary of the proposed site is a significant recreational and biological area. The creation of additional marsh, should mitigate physical impacts of the proposed facility. The existing biological resources are considered important and may require relocation (e.g. clam habitat and fishery spawning areas). Final design should include features to minimize changes in circulation

patterns and existing topography. To assure containment the facility would have to confine all pollutants, and monitoring of organisms, sediments, and the water column would be required. Analysis of productivity and ecological interrelationships would have to be undertaken if the project were to go forward. Additional site-specific investigations would determine the potential for the containment facility to improve the biological habitat value as mitigation. Monitoring would be required to assess mitigation success and assure pollutant containment.

As shown in Figure 4 a portion of the Cedar Island spit area is designated a barrier beach under the federal Coastal Barrier Resources Act of 1982. This legislation restricts federal activities in such an area and limits development in general.

In addition, the State of Connecticut feels that the Hammonasset/-Cedar Island spit area is an outstanding example of habitat considered critical in the State. In May 1985, the governor designated the area as a Natural Area Preserve, which will protect it from physical alterations such as dredging and filling.

BLACK LEDGE

Background

The concept of a dredged material containment facility (DMCF) at Black Ledge was originally considered by the Navy in their final EIS (1976) concerning dredging in the Thames River. It was stated in that report that a "steel pile containment structure approximately 1.5 miles in perimeter" would be required along with the "deposition of between 60,000 and 100,000 cubic yards of riprap material." The riprap, "would be placed on both sides of the piles." While no precise cost estimates were attempted, this disposal alternative was rejected "not economically feasible" and creating "an additional navigation hazard." However, the city of Groton Conservation Commission and Harbor Study Commission (by letter 21 Nov 1977 and 12 April 1979) recommended further consideration of the site as a possible containment facility location.

Site Description

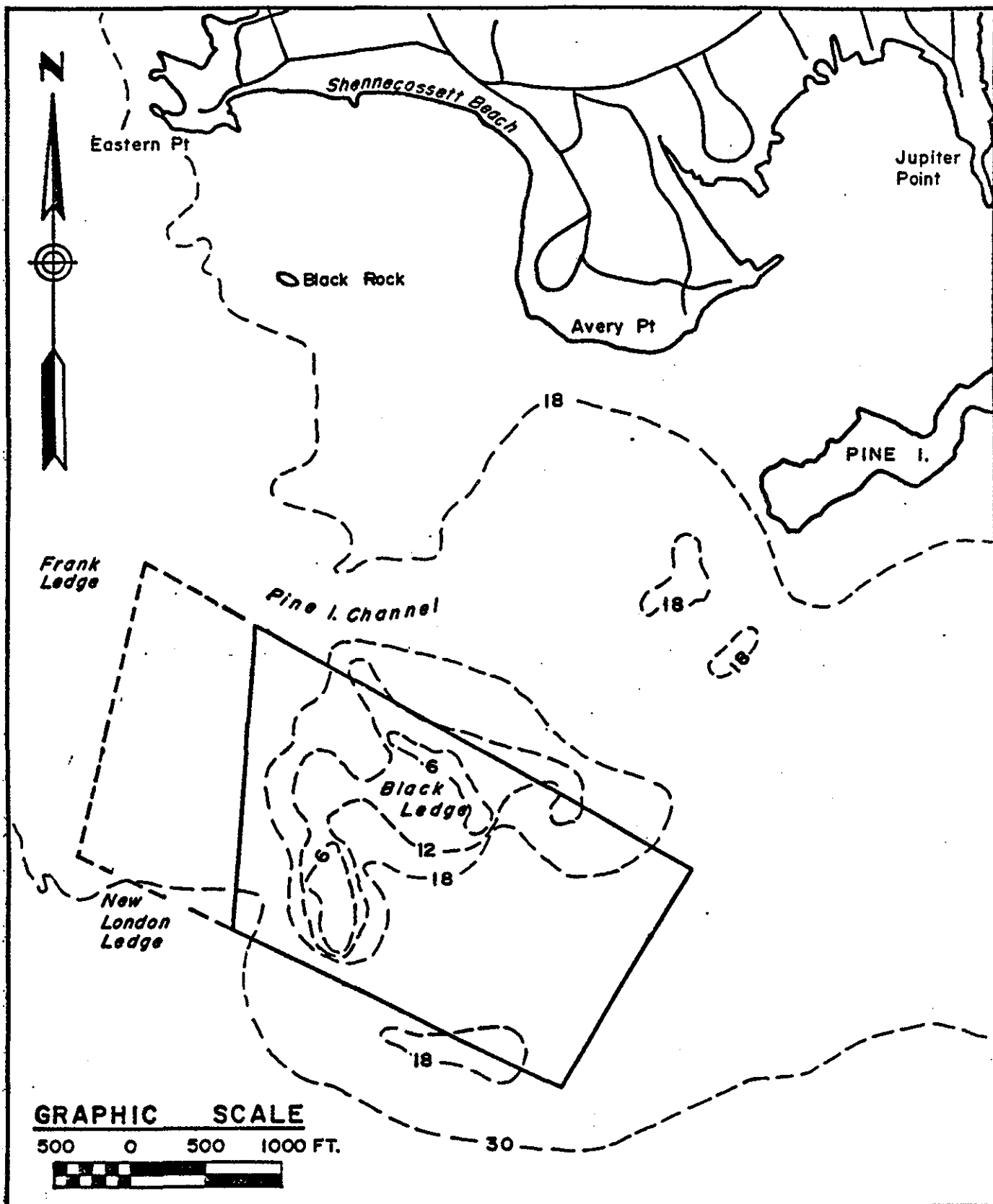
The identified DMCF site at Groton-New London, shown in Figure 5, is located approximately 1 mile outside of the entrance to New London harbor to the east of the harbor entrance channel. The site comprises a rocky shoal area known as Black Ledge where water depths rise rapidly from the surrounding 20- to 30- foot depths (MLW) to less than 10 feet (MLW) over much of the shoal. A small pile of rocks approximately 10m² near the western limit of the ledge is exposed at most tidal elevations. The total area of the shoal (depths within the 18-foot isobath) is approximately 320,000m², or about 0.1 square mile.

The topography of the area is primarily controlled by bedrock, although glaciation has extensively modified the original topography. Maximum land elevations in the area are about 50 feet NGVD. The offshore area is generally flat, with numerous areas of resistant bedrock, such as Black Ledge, providing relief. Minimum offshore elevation at the site is approximately -14 feet NGVD.

Based on the borings and probes performed at Black Ledge, the thickness and nature of the overburden is quite variable. Thicknesses ranged from exposed bedrock to over 40 feet of cover. Up to 8 feet of recent organic, silty sand was recovered. Underlying this material was a sequence of compact gravel, sand, silt and varved clay, which may be glacial in origin. Refusals encountered by the probes were assumed to be bedrock and two of the five borings recovered apparent bedrock samples.

Project Formulation

Black Ledge was considered as a regional containment facility with the primary source of dredged material to come from the Thames River-Groton-New London area. This regional facility could accept material from surrounding harbor such as Niantic Bay and Harbor Mystic River, Stonington



LOCATION MAP, BLACK LEDGE, GROTON, CONNECTICUT

Harbor and the Pawcatuck River, or largely, the Eastern Connecticut section of the sound.

The Black Ledge containment facility could meet the disposal needs of the eastern coastal area for a 50-year period. As seen in Table 10 the needs for the region vary from 4.7 million to 9.5 million cubic yards depending on the scenario and future dredging activity. The containment facility could hold about 7.5 million cubic yards of material.

Table 10
DREDGED DISPOSAL NEEDS - EASTERN CONNECTICUT (1985-2035)

Volume of Material, cubic yards			
<u>Harbor</u>	<u>Minimum Growth</u>	<u>Most Probable Future</u>	<u>Maximum Growth</u>
FEDERAL MAINTENANCE			
Niantic	80,000	120,000	160,000
Thames	600,000	800,000	1,000,000
New London		500,000	500,000
Mystic	25,000	50,000	75,000
Stonington	--	--	--
Pawcatuck	<u>75,000</u>	<u>100,000</u>	<u>125,000</u>
Subtotal	780,000	1,570,000	1,860,000
FEDERAL IMPROVEMENT			
New London		1,600,000	1,600,000
Others	<u>200,000</u>	<u>300,000</u>	<u>500,000</u>
Subtotal	200,000	1,900,000	2,100,000
PERMIT DREDGING			
	<u>3,696,000</u>	<u>4,620,000</u>	<u>5,544,000</u>
Total	4,676,000	8,090,000	9,504,000

Source: Long Island Sound Dredged Material Containment Study - Progress Report. Feb 1983

The Black Ledge site would probably be established as a marine wildlife sanctuary. After completion of the outside retaining dikes, filling would be accomplished within interior containment cells which would allow wetlands to be established soon after project completion. The plan for ultimate use would require that approximately 2 feet of fill be placed on top to properly isolate any contaminated material.

Design Consideration

The proposed dike would be constructed of rock and gravel in 5 to 35 feet of water. The dike would be approximately 9250 feet long, extending completely around Black Ledge and creating a 125-acre containment facility. Soil conditions in the foundation area consist of up to 6 feet of surficial deposits of very loose silty sand with shell fragments and plant matter. Original alignments were modified to avoid greater depths (up to 12 feet) of soft compressible soil. The change in alignment also placed the facility 1000 feet more distant from the navigation channel, thereby reducing the potential navigation hazard.

The elevation of the structure would be about +13.5 MLW (+14.5 NGVD). Since the maximum depth of water at the site is up to 35 feet, the dike would rise as much as 50 feet above the floor of Long Island Sound. Design wave heights in the area of the facility are expected to be up to 6 feet high. Overtopping of the dike might occur with waves of this magnitude. Therefore, slope protection would be placed on the ocean side of the dike and over the top of the crest and down the inside slope.

Since Black Ledge is located about 3000 feet offshore, all materials would be transported to the site by barge. Placement of the core material would be by bottom dump barges to about -10 feet MLW. Above this elevation, placement would be by cranes operating from floating barges. Over 1.2 million cubic yards of material would go into building the containment facility, exclusive of two interior dikes which would create the three interior cells.

Table 11
CONSTRUCTION MATERIALS, BLACK LEDGE SITE

<u>MATERIAL</u>	<u>QUANTITY</u>
1,000 - 2,000 lb. Armor Stone	88,800 cy
300 - 600 lb. Armor Stone	27,000 cy
100 - 200 lb. Underlayer Stone	162,000 cy
30 - 60 lb. Underlayer Stone	42,000 cy
Quarry spalls to 50 lb.	<u>883,800 cy</u>
TOTAL	1,204,200 cy

Quarried rock material of suitable quality and sufficient resistance to weathering and disintegration is available from commercial suppliers within a 40-mile radius of the study site. It may be necessary to obtain the desired quantity of quarry spalls from a combination of suppliers.

The Black Ledge containment facility is located far enough offshore to mandate a conventional bucket/scow operation rather than the much more economical hydraulic dredging. The use of barges necessitates a rehandling facility, thereby adding to the cost of the structure and normal dredging operations.

Economic Analysis

The cost of the Black Ledge containment facility is estimated at \$40,385,000, exclusive of a weir structure, compartment dikes and a possible rehandling system. Representing an annual cost of nearly 5 million dollars, disposal at the containment facility is more than 4 times more costly than open-water disposal. With the site of the containment facility near the New London open water disposal site, there are no transportation savings and no operational savings since hydraulic dredging would not be used. A summary of the economic analysis is shown below.

Table 12
Black Ledge
Estimated Cost by Disposal Alternatives

Containment Facility

First Cost	
Dike	\$30,595,000
Contingency 20%	<u>6,119,000</u>
36,714,000	
E&D 4%	1,468,000
S&A 6%	<u>2,203,000</u>
Total First Cost	<u>40,385,000</u>
Annual Cost	
Int & Amort (.08395)	3,390,000
Mob & Demob	135,000
Dredging	<u>1,287,000</u>
Total Annual Cost	\$4,812,000

New Haven Dump Site

First Cost	
Mob & Demob	\$ 93,000
Dredging	<u>1,188,000</u>
Total Cost	\$ 1,281,000

The Race Dump Site

First Cost	
Mob & Demob	\$ 93,000
Dredging	<u>1,188,000</u>
Total Cost	\$ 1,281,000

Socio Economic Issues

The socio-economic impacts as summarized below include:

- The large volume of dike material required could result in significant traffic congestion and construction hazards particularly during the short term construction period.
- Because of the large volume of recreational and commercial boat traffic at the entrance of New London Harbor, boating hazards associated with vessel movements to and from the DMCF during development and operation could result. The long operating life of the facility could extend these concerns over a long period of time.
- The island creation project would displace marine life.
- Although the site is some distance offshore, its size would reduce the panoramic view from shoreline. The DMCF island, however, would be similar in appearance to other nearby islands.
- The issue of jurisdiction of the created lands would need resolution.
- Local authorities are concerned that the DMCF could become an attractive nuisance to area boaters and would be difficult to supervise.
- The placement of a containment facility at Black Ledge would act as a barrier and reduce wave heights in the Avery Point area, thereby reducing tidal flood damages.

Environmental Considerations

Black Ledge: The following environmental summary discussion of Black Ledge is based on the report entitled "Environmental Baseline Data Collections and Site Evaluations, Long Island Sound Container Disposal Study-Black Ledge, Groton-New London Harbor, Connecticut". The bottom substrate is composed of three areas consisting of rock (including large angular boulders), sand/gravel (including muddy sand; 0.23 mm average diameter), and silts and clay. The benthic sampling showed 184 taxa representing over five major groups. The dominant groups were polychaetes (41.3%), crustaceans (26.1%), and molluscs (25.0%). The density ranged from 4,637/M² to 65,250/M², in the study area. The species diversity ranged from 0.6973 to 4.4363 and the species evenness ranged from 0.1301 to 0.8006, in the study area. The silt/clay substrate stations had the greatest densities (36,672/M²) followed by the rock stations (9,907/M²) and the sand/gravel stations (7,311/M²). Species diversity at the shallow rock substratum stations was higher than at the silt/clay stations despite lower species richness and densities. Intermediate depth sand/gravel stations had highest diversities with least faunal densities. The patterns appear to be related to bottom stability.

There appear to be four community types in the study area corresponding to the four sedimentary types. The deposit-feeding community in the muddy area west of the ledge corresponds to the Nucula-Nephtys (bivalve-polychaete) assemblage described by Sanders (1960). The amphipod dominated community was found on the muddy sands with surface particle feeding mode. A mixed community of surface particle and filter feeders with low dominance is found on the gravel. A hard-bottom community dominated by Mytilus edulis is found on the ledge.

Fifty-two species of algae were recorded from subtidal stations. Rhodophyta species (Red Algae) comprised between 64 and 70 percent of the total species recorded at each station. Species richness and dominance was not related to depth or location. Chondria tenuissima (red algae) was the dominant species. The dominance patterns were strongly influenced by the dense concentrations of Mytilus edulis (blue mussel). Epiphytic and ephemeral species were dominant because of the substrate provided by M edulis and competition for hard substrate.

The Black Ledge area is a heterogeneous benthic habitat supporting a diversity of species. The high abundance of organisms suggests that the area provides food and habitat for large invertebrates and fish. The area experiences strong and periodic scouring. The placement of uncontained material would experience rapid dispersal.

The proposed facility would affect directly about 150 acres of productive benthic resources and remove approximately 75 percent of the existing Mytilus edulis community from the area. The facility would cause accumulation of finer grained sediments on the leeward side which may affect the surrounding benthic habitat.

The construction of the containment breakwater would replace some rocky habitat for Mytilus edulis and associated organism. A saltmarsh could be planted within the containment facility to provide a high value habitat. The proposed containment facility would impact on approximately 150 acres of significant biological resources. With proper design and alignment, impacts could be reduced and mitigated by new marsh creation.

If this project were to proceed, site specific studies would have to be undertaken to determine the kind and extent of mitigation required to compensate for the biological and other impacts. These studies would include existing natural resources, commercial and recreational fisheries, biological productivity, visual changes, odor, noise, aesthetic affects, land use, and archaeological resources.

PENFIELD REEF

The Fairfield Conservation Commission recommended consideration of this site, which is located offshore of the town's beach area. The primary use would be to provide a containment facility for dredged material disposal and at the same time provide a secondary use as a tidal flood and shoreline protection structure.

Background

Extensive shoreline changes have occurred in the Fairfield coastal and Penfield Reef areas. At the time Fairfield was settled in 1639, a 2-mile barrier beach and system of sand dunes existed on the coastline. Historical records show that a peninsula and island extended well over a mile from Shoal Point. Early accounts describe a 100-200 acre peninsula used by early colonial farmers to pasture sheep and cows. In addition to grazing, the peninsula was also used as a source for ballast stones by early shipping interests. The overgrazing and removal of stones left the island without protection from nature's forces. Wind and waves began to erode the soil and the peninsula soon became an island, then a hammock, then a bar, and today a reef of constantly decreasing elevation. The material from the reef first moved to extend the barrier beach. After removal of the material from the peninsula that served to replenish the beach, the beach began to erode, much to the concern of shoreline residents who moved onto the beach. Therefore, the town of Fairfield, through construction of the containment facility, hopes to meet not only navigation related needs as well as recreating a shoreline configuration that existed 300 years ago.

Site Description

Penfield Reef now consists of a small offshore island and a cobble covered submerged ridge extending about 1 mile from the shoreline at Shoal Point. The ridge elevations vary from -2.7 NGVD (+0.2 MLW) at the west end shoreline -13.7 (-10.8 MLW) at the east end. The eastern one-fourth is submerged at mean low water. The mean tide range at the site is 6.9 feet with a spring tide range of 7.9 feet. The 100-year stillwater tide elevation is 10.4 feet NGVD. Design wave heights are 6.5 feet from the north and 5.0 feet from the south.

Soils in the area vary from sand and silt to sand and gravel. Although borings and probes were carried to depths of up to 40 feet bedrock was not encountered.

Project Description

Project formulation considered two configurations for a containment facility at Penfield Reef (see Figure 6). The initial plan, envisioned a long narrow peninsula extending more than 1 mile from shoreline closely duplicating the original peninsula which was eroded away. The site would

contain about one million cubic yards of material at a cost of about \$8 million. Alternatively, if the outer portion of the peninsula were widened into a containment island, up to 4.3 million cubic yards could be contained. Even with a higher cost of \$8.6 million, the result would be a significantly more efficient structure. This facility would contain the 4.3 million cubic yards with a dike about 16,000 feet long in an area of about 300 acres.

The dike would be constructed of rock and gravel in zero to 15 feet of water. The most economical construction method would be to truck material obtained from local land sources spreading it from shore outward using bulldozers. Water depths are shallow so as to preclude use of barges. The dike would be designed with a crest elevation of 10.6 feet NGVD. This crest could be overtopped if the 6.5-foot design wave were to occur. Armor stone of up to 2750 pounds each would be placed on the ocean side and extended over the top to provide slope protection.

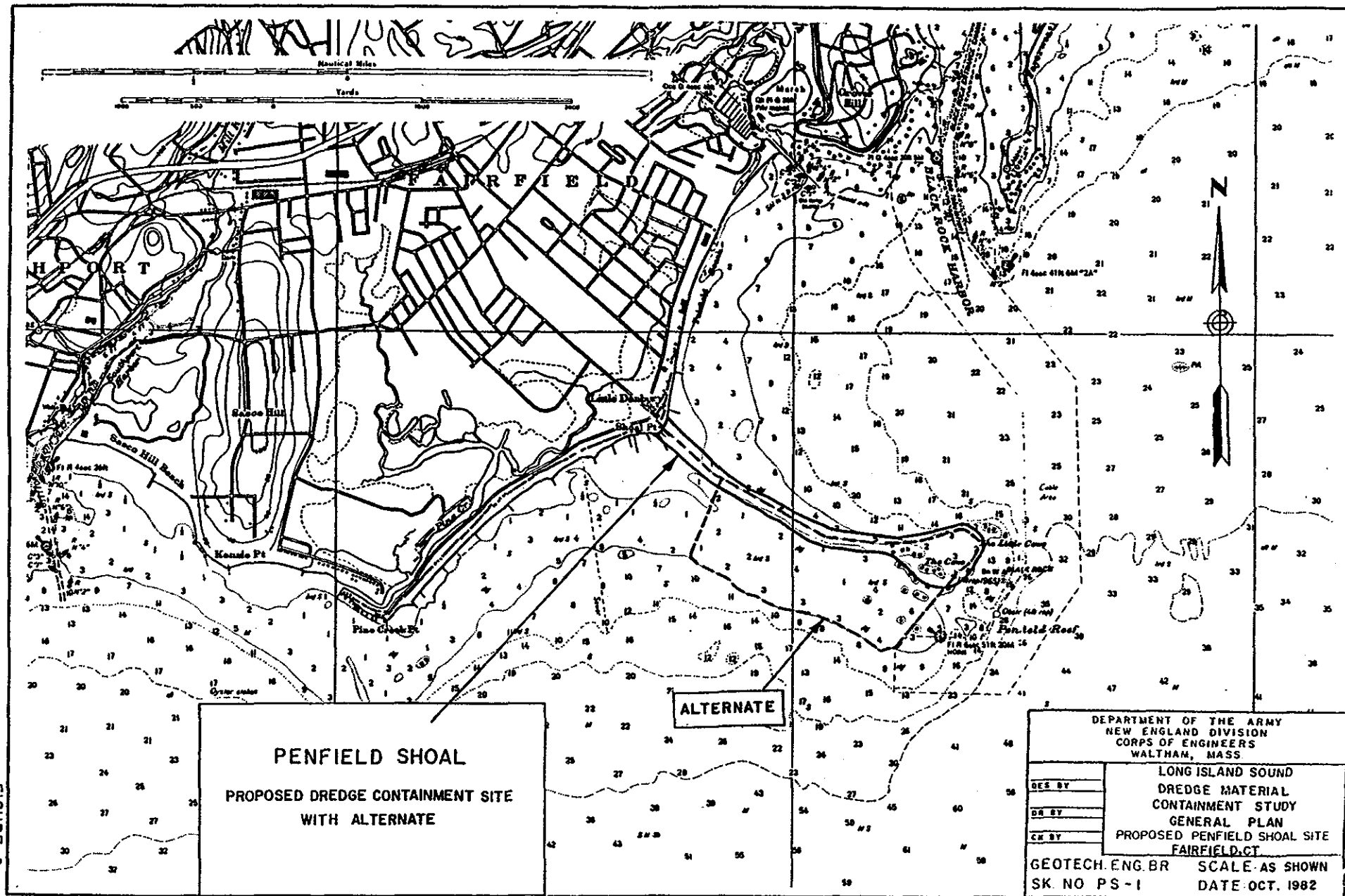
An optional feature of the containment facility as proposed by Fairfield was to provide a reservoir of clean sand outside of the diked area. This would serve as a sacrificial sandbar varying in size depending on current scouring action and rate of replacement. Littoral drift would sweep this sand westerly to replenish the Fairfield coastal beaches which are rapidly eroding and receding. This process would duplicate the process of the last 200 years which saw the gradual deterioration of the peninsula. To verify the effectiveness of this concept, along with the design of the near-shore area, requires more study.

Dredging Operations

The Penfield containment facility could meet the disposal needs of several surrounding harbors for at least a 25-year period. These harbors, including Westport Harbor/Saugatuck River, Southport, Bridgeport/Black Rock Harbor and the Housatonic River, are from 2 to 8 miles distant from Penfield. Actual distances and comparable distances to open-water disposal areas are shown below.

Table 13
Distance to Alternative Disposal Site (Miles) - Penfield

<u>Harbor</u>	<u>New Haven</u>	<u>WLIS III</u>	<u>Penfield</u>
Westport/Saugatuck River	.25	10	7
Southport	20	14	3
Bridgeport	15	19	4
Black Rock	18	19	2
Housatonic	11	23	8



The volume of material that could be expected from the above mentioned harbors has been estimated for the 50-year period 1985-2035. Table 13 summarizes these volumes for the Minimum Growth and Most Probable Future conditions for both Federal and non-Federal dredging operations. Based on these volumes and the 4.3 million-cubic yard capacity, the containment facility would meet disposal needs for these harbors from 24 to 41 years depending on level of activity.

Table 14
Penfield Reef Containment Facility
Potential Contributors and Volume of Dredged Material (1985-2035)

Volume of Material (cubic yards)

FEDERAL MAINTENANCE

Harbor	Min. Growth	Most Probable Future
Westport/Saugatuck	20,000	70,000
Southport	100,000	150,000
Bridgeport	1,925,000	2,475,000
Housatonic	800,000	1,000,000
Sub Total	<u>2,895,000</u>	<u>3,695,000</u>

FEDERAL IMPROVEMENT

Bridgeport	0	2,500,00
Black Rock	150,000	150,000
Others	200,000	300,000
Sub Total	<u>350,000</u>	<u>2,950,000</u>

NON-FEDERAL

Subtotal	1,996,000	2,495,000
Total	<u>5,241,000</u>	<u>9,140,000</u>
Ave. volume per year	105,000	183,000
Years to fill a		
4,300,000 cy DMCF	41	24

A hydraulic dredge could be used at Black Rock Harbor, but with distances of from 2 to 3 miles, a booster pump would be required. For other harbors, mechanical dredging with bucket/skow would be the most likely method of operation. This could necessitate either a pump-out facility or rehandling basin at the containment facility to offload the barges.

Economics

The estimated first cost of the Penfield containment facility is \$8.6 million. The annual costs are summarized below.

Table 15
Costs by Disposal Alternative

	Min Growth	Most Prob.
CONTAINMENT		
First Cost		
Dike	\$ 8,596,000	
Contingency 25%	<u>2,149,000</u>	
	10,745,000	
 E&D 4%	 430,000	
S&A 6%	<u>645,000</u>	
	\$11,820,000	
 Annual Cost		
Amort. 8-3/8 %	\$ 1,031,000	\$ 1,143,000
	(40 yr)	(25 yr)
Mob & Demob. (2)	270,000	270,000
Dredging	<u>1,365,000</u>	<u>2,379,000</u>
Total	\$ 2,666,000	\$ 3,792,000
 NEW HAVEN		
Mob & Demob. (2)	\$ 186,000	\$ 186,000
Dredging	<u>1,260,000</u>	<u>2,196,000</u>
Total	\$ 1,446,000	\$ 2,382,000
 THE RACE		
Mob & Demob. (2)	\$ 186,000	\$ 186,000
Dredging	<u>1,575,000</u>	<u>2,745,000</u>
Total	\$ 1,761,000	\$ 2,931,000

Disposal at the Penfield DMCF is about 1.8 times more costly on an annual basis than open water disposal, reflecting primarily the cost of the containment facility.

Environmental Considerations

The following environmental information is based on a report entitled, "Analysis the Site Evaluation for Long Island Sound Container Disposal Sites" (May 1984). Penfield Reef is comprised of the eroded remnants of an offshore island and a tombolo extending approximately 1 mile west to the Shoal Point shoreline. The tombolo is exposed at low water and provides shelter to Fairfield Beach and Black Rock Harbor to the north. The seaward side of the tombolo is fronted by a terrace of hard

sand, extending roughly 2000 feet offshore to the 6-foot depth contour (MLW). The crest is armored with coarse gravel and cobble, evidence of the repeated agitation provided by breaking waves during high tides. Under less extreme conditions, the shallow, mild sloping profile of the terrace produces a wide surf zone characterized by spilling breakers.

In 1982, a summer benthic survey found the hard-bottom macrofaunal and algal communities of the shoals to be productive. The area supported 122 benthic invertebrate taxa and 23 species of algae. The dominant forms were the amphipods Jessa falcata, Corophium sp, and Caprella penantis. These three taxa in equal proportions, represent approximately 80 percent of the total number of individuals recorded. These organisms are typical of hard-bottom northeast environments. The soft-bottom density averaged 1230 individuals per square meter for the 11 stations sampled. The polychaetes Mediomastus sp, Spiophanes bombyx, and Streblospio benidicti were the dominants at several stations, while the bivalve Mulinia lateralis, the gastropod Actecina canaliculata, and several oligochaetes were dominant at two stations.

During summer 1983, a benthic survey of the area recorded 112 macrofaunal taxa which were represented by polychaetes (45%), crustaceans (23%), and molluscs (20%). The density was 5516 per square meter for the 15 stations sampled. The capitellid polychaete Mediomastus ambiseta was the most dominant organism followed by the bivalve Tellina agilis.

The variation in density and species composition is an indication of the changing environment in the area of the proposed containment facility. The area appears typical of this kind of habitat for the northeast and does not appear to support any unique species or community assemblages.

If the proposed dredged material containment facility were to consist of a diked structure aligned with the axis of the tombolo, it would not extensively encroach on the terrace. The facility would lie within the present limits of the surf zone and might prevent overwash to the northern side of the reef which would minimally decrease the supply of sediment to this area. Water quality impacts would occur during construction of the facility. The proposed facility would eliminate approximately 300 acres of productive benthic habitat, which includes some hard-bottom habitat. In addition, potential impacts include: creation of salt-marsh habitat, aesthetics change from open water to a containment facility, noise, odor and dust increases, and confinement of pollutants.

The containment area, however, would offer potential for expanded areas of saltmarsh habitat and would confine any pollutants present in the dredged material.

If Penfield Reef is considered further for a containment facility, then additional site-specific studies would have to be undertaken to assure that the alignment impacts the least productive area and that

adequate mitigation/compensation measures are indentified. These studies would include: biological productivity, water quality, sedimentology, social concerns (eg noise, odor, dust, aesthetics), and archaeological resources.

Other Impacts

The Fairfield Conservation Commission has summarized other positive and adverse impacts. Benefits would include:

- Increased storm and hurricane wave protection to the hundreds of homes along the shoreline.
- Increased protection for any direct beach nourishment program.
- Provision for continually resupplying sand to the naturally eroding beaches through programmed depletion and resupply of sacrificial sand around the peninsula.
- Restored protection to Black Rock Harbor from south and southwest waves by reducing their fetch from 20 miles to 1 mile.
- A tendency to reduce the normal drift of available sand due to a lower wave energy regime in the lee of the peninsula.
- Provision for enhanced public and private property values in Fairfield and Bridgeport.
- Public recognition and commitment to correct a serious beach erosion problem which will result in loss of dense residential development. Such commitment could include establishing a shore management board, guiding the public and private use, restoration and management of the barrier beach, peninsula, shore, dunes and tidal wetlands in Fairfield.
- Utilization of an existing hazard to navigation thereby reducing its threat to commercial and recreational boating. By recreating the peninsula above the existing reef, local mariners will be less inclined to "jump the bar" and go around as a result.
- Provision for long-term, cost-effective maintenance and expansion of harbors, channels and marine-oriented facilities in the Greater Bridgeport Region.
- Provision for recycling dredge spoil currently viewed as a waste product by most people today.
- Provision for creating new wildlife habitat.
- Expansion of existing public park and marine areas. Since the Peninsula would be developed from the sea floor as an extension of Fairfield, it is anticipated it would remain as a public resource.
- Expansion of public recreational beach for fishing and swimming with maintenance responsibility contingent upon the uses approved by the town.
- Possibility of increasing shellfish production by decreasing the opportunity for sewage effluent/suspended sediment from reaching the beds during the critical summer spawning period. Because of this effect, local oyster companies have indicated preliminary support for this proposal.
- Increased protection of the sanitary sewer outfall, thereby reducing the likelihood of pipe failure in the nearshore area.

Adverse effects of recreating Penfield Peninsula could include:

- Possible objection of beachfront property owners in close proximity to the base of the peninsula during the construction period.
- Outright loss of habitat for fish, shellfish, lobsters, etc., due to the physical covering of the reef by the "footprint" of the peninsula. However, new sediments deposited in the area could actually increase fish and bottom-dwelling organisms by introducing more diversity in habitat.
- Loss of small-boat navigation over the Reef at high tide.

In general this area currently produces excellent fishing for striped bass, tautog, blue fish and weak fish and would be expected to continue to do so. Public harvests of shellfish would not be affected because the area is closed due to the proximity of the sewer outfalls from Fairfield and Black Rock Harbor.

MILFORD HARBOR

Background

The Long Island Sound Dredged Material Containment Study identified six potential containment sites along the Milford shoreline as part of its site screening process. This list was supplemented by three additional sites which were recommended by local interests. One of these sites, which was identified by the Milford Harbor Improvement Commission was selected for detailed study. The site is situated in the outer harbor area adjacent to the Federal channel and is easily accessible to dredging operations.

Site Description

Milford Harbor is located at the mouth of the Wepawaug River midway between Bridgeport and New Haven. It is used chiefly for recreational boating. The Federal navigation project at Milford provides for two riprap jetties at the mouth of the river, a channel into the outer harbor, about 4000 feet of channel into the inner harbor and about 10 acres of anchorage area. Extension of the anchorage was investigated, but action was deferred at the request of the city.

The coast in this area has an irregular shoreline with points and headlands separated by coves which, at this location, is referred to as "the Gulf." Currents and sediment transport in this coastal reach have created wide sandy beaches to the west while Gulf Beach on the east shore is naturally cobbly and narrow because of erosion. A beach restoration project here has provided for a sandy 1200-foot long public beach about 100 feet wide.

Project Formulation

In identifying a potential containment facility at Milford, local interests were interested in providing a site to accommodate dredged material from their harbor. This concept is set forth in the town's Coastal Management Plan with the possibility of using such a containment area for expanding the public lands in the coastal area. A site located adjacent to the harbor entrance would allow public access and be within pumping distance for hydraulic dredging operations.

The Harbor Commission originally identified a site offshore from Burns Point and Fort Trumbull Beach (see Figure 7) on the west side of the Federal channel. A facility about 500 feet x 1000 feet would hold about 400,000 cubic yards, which would accommodate dredging needs for nearly 50 years.

Table 16
Milford Harbor
Dredged Material Disposal Needs 1985 - 2035

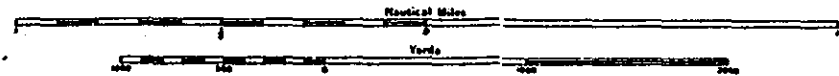
	Dredged Material Minimum <u>Growth</u>	Volume, ^{1/} cubic yards Most Probably <u>Future</u>	Maximum <u>Growth</u>
Federal Maintenance	120,000	240,000	240,000
Federal Improvement	(None envisioned)		
Permit Dredging ^{2/}	<u>95,000</u> 215,000	<u>190,000</u> 430,000	<u>190,000</u> 430,000

^{1/} Source: Progress Report

^{2/} Based on same percent of regional total as Federal Maintenance

During early site review and coordination, the Milford City Engineer, suggested the facility site be moved to the eastern side of the channel to take advantage of the ocean currents and the littoral drift process. If the containment facility were located on the westerly side of the channel the erosion process at Gulf Beach would result in a build up of sand within the harbor channel and require more frequent maintenance. If the containment were constructed on the easterly side of the channel the sand buildup would occur in the Gulf Beach area due to the westerly nature of littoral drift. The sand accretion would benefit the beach area, while the scouring action on the west side of the containment would tend to prevent littoral sand accumulation in the harbor channel. As presently sized, the facility would contain about 270,000 cubic yards which would accommodate from 25 to 50 years of dredging - depending on level of activity.

**MILFORD HARBOR
PROPOSED DREDGE CONTAINMENT SITES**



DEPARTMENT OF THE ARMY NEW ENGLAND DIVISION CORPS OF ENGINEERS WALTHAM, MASS.	
LONG ISLAND SOUND DREDGE MATERIAL CONTAINMENT STUDY GENERAL PLAN PROPOSED MILFORD HARBOR SITE MILFORD, CT.	
DES. BY	
DR. BY	
CK. BY	
GEOTECH ENG. BR.	SCALE: AS SHOWN
SK. NO. MH-1	DATE: OCT. 1982

Design Considerations

Subsurface conditions at the eastern site appear suitable to support a dike constructed of quarry chips protected by armor stone. Overburden soils, as determined by subsurface explorations, are predominantly loose to dense granular materials. The facility would be located in water depths from zero to 14 feet at mean high tide. The most economical method to construct the dike core would be to dump material obtained from local borrow areas, and then spread the material from the shoreline outward using bulldozers. Barge placement of the dike core would not appear possible due to the shallow water depths.

The material selected for the dike core must be strong enough to support construction equipment and heavy enough to resist erosion from tidal fluctuations during construction. Quarry chips up to 150 pounds in weight would meet the above criteria, however, they would probably be too pervious to retain the dredged material. Therefore, an 18-inch thick gravel blanket would be placed on the containment sideslope to retain the dredged material.

The ocean sideslope could be impacted by up to 5.5-foot design waves. A 4-foot layer of 750-pound to 1250-pound armor stone would be required to protect the ocean side from erosion. The armor stone could be placed using crane(s) situated at the crest of the dike core.

The crest (elevation 9.5) of the proposed dike would be protected from overtopping waves by extending the armor stone over the crest of the core. The gravel blanket that would be placed on the containment side slope of the dike to retain dredged material could be damaged by the overtopping waves. It is expected that periodic maintenance would be required to repair the gravel blanket until the containment facility was filled.

The following material would be required to construct the proposed Milford Harbor dredged material containment facility:

Table 17
Construction Materials - Milford

<u>Materials</u>	<u>Quantity</u>
750 to 1250 lb. Armor Stone	20,900 CY
Quarry Chips to 150 lb.	73,700 CY
Gravel	4,200 CY

The construction materials listed above are available from developed and undeveloped sources within a 30-mile radius of the proposed site.

Economic Analysis

Based on analyses to date, the cost of the Milford Harbor dredged material containment facility is estimated at \$2,612,000 (see Table 18) exclusive of a weir structure and interior compartment dikes if necessary. Considerable savings (\$93,000 or \$160,000) in dredging costs are available from possible use of a hydraulic dredging operation instead of transporting the material to the New Haven Disposal Area with a bucket/scow dredging operation. However, these are not enough to offset the costs of a containment facility, and annual costs are about 50 percent higher than open water disposal. These increased costs would have to be balanced against other benefits such as sand accretion in the Gulf Beach area, possible reduced maintenance requirements in the Federal channel, potential future public use of the containment facility and reduction of wave heights in the harbor.

Environmental Considerations

Environmental consideration are based on a report prepared for this study entitled, "Ecological Surveys of Penfield Reef and Milford Harbor" (November, 1982). Benthic sampling was conducted during the summer 1982 but biologist-divers were restricted by both high wave surge and low visibility problems during the entire survey. The Milford Harbor represents a typical productive northeast estuarine habitat. The qualitative visual impressions of the substrate were: few lobsters in area, high number of flounder, many crabs: Limulus polyphemus and Pagurus sp., several sponges, and algae cover: Laminaria sp, Fucus sp. The substrate appears to be predominantly reef with cobble and gravel and some interspersed sandy areas.

The data indicated a unique assemblage of taxa on the reef dominated by three (3) amphipods: Caprilla penantis, Jassa falcata, and Corophium sp. In addition, there was a high diversity of species associated with hard substrates. The soft substrate is dominated by polychaetes Staeblospio Benedicti, Scoloplos sp., and Scolecopides sp. Twelve stations were surveyed. The number of taxa ranged from 8 to 48 with density from 284 to 24,872 per square meter. The dry biomass was generally low and ranged from 0.01 to 20.59 gm. The stations appear to have high species diversity.

Limited information is available on the biological resources of the containment area. The Milford area supports the leading market area for both oysters and hard-shell clams. Site specific studies would have to be undertaken if this area is considered further for a proposed containment facility. These studies would include: existing biological resources at the containment site (data presented above is from a nearby area); biological productivity; recreational and commercial fisheries; water quality, circulation and current patterns; social concerns (eg. aesthetics, noise, dust, odor); and existing land uses. Based on given

Table 18
Milford Harbor
Costs by Disposal Alternative

Containment Facility

First Cost

Dike	\$1,900,000
Contingency 25%	<u>475,000</u>
	2,375,000

E&D	95,000
S&A	<u>142,000</u>
Subtotal	\$2,612,000

Annual Cost

Int & Amort (.08291)	\$ 216,000
----------------------	------------

Mob & Demob	\$ 69,000
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Dredging	<u>\$ 93,100</u>
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TOTAL COST	\$ 378,000
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New Haven Dump Site

First Cost	-
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Mob & Demob	\$ 93,000
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Dredging	<u>159,600</u>
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TOTAL COST	\$ 252,600
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The Race Dump Site

First Cost	-
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Mob & Demob	\$ 93,000
-------------	-----------

Dredging	<u>186,200</u>
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TOTAL COST	\$ 279,200
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information and with proper alignments of the proposed facility, it is felt that significant biological impacts could be mitigated.

SHERWOOD ISLAND BORROW HOLE - WESTPORT

During construction of the Connecticut Turnpike, fill was obtained from several subaqueous borrow pits along the LIS coast. The Sherwood Hole is one of the sites suggested as a possible dredged material disposal area by the Aquaculture Division of the Connecticut Department of Agriculture. As such, the Sherwood Hole is not a containment facility per se even though the material is contained.

The Sherwood Hole is located about 1000 feet offshore of Sherwood Island State Park (see Figure 8) and situated in an area where water depths are normally about 20 feet. At the borrow hole, however, depths of an additional 30 feet are present. Volumes calculated for the capacity of the hole, based on hydrographic surveys, indicate that the about 750,000 cubic yards could be contained based on filling to an elevation of -30 MLW. Such a capacity could handle the dredged material needs from the Westport/Saugatuck River area, Southport Harbor, and other areas for the next 50 years (see Table 19).

Table 19
Dredged Material Disposal Needs (1985 -2035)
Westport, Saugatuck R. and Southport Harbor

Volume of Material			
<u>Federal Maintenance</u>	<u>Minimum Growth</u>	<u>Most Probable Future</u>	<u>Maximum Growth</u>
Westport/Saugatuck R.	70,000	70,000	140,000
Southport	<u>100,000</u>	<u>150,000</u>	<u>200,000</u>
	170,000	220,000	340,000
Federal Improvement	(None envisioned)		
Permit Dredging <u>1/</u>	<u>170,000</u>	<u>220,000</u>	<u>340,000</u>
TOTAL	340,000	440,000	680,000

1/ Assumed same as Federal Maintenance.

The Sherwood Hole is representative of other such borrow pits along the LIS coastline, specifically Morris Cove and Prospect Beach in New Haven and Laurel Beach in Milford. Four issues need to be considered regarding their use as disposal areas.

1. Environmental conditions are generally anoxic/anaerobic with little life. Filling the hole would serve to reclaim these areas.

2. The areas may be surrounded by beaches and environmentally sensitive areas such as shellfish beds. Generally only clean material should be disposed of in these areas.

3. Filling in the holes may preclude further use as a borrow pit.

4. Costs of dredging and disposal at Sherwood Hole would be about equal to open water disposal.

These sites could meet the disposal area needs for small harbors such as Westport, but they do not exist in sufficient numbers to meet disposal needs for the LIS region.

Environmental Considerations

In the summer of 1983, benthic grab samples were undertaken at 15 stations recording 49 taxa represented by polychaetes (39%), Molluscs (33%), and crustaceans (14%). Mulinia lateralis (filter-feeding bivalve) accounted for 55 percent of the individuals collected followed by Mediomastus ambiseta a deposit-feeding capitellid accounting for 21 percent M lateralis is an opportunistic bivalve requiring a stable bottom environment (Rhoads, 1974). The second survey (also taken in summer 1983) show similar results but with a decrease in the number of taxa and density. The most dominant species was M lateralis, but the second was Streblospio Benedicti, an opportunistic polychaete. The sediments within the pit appeared to be somewhat anoxic and, therefore, the benthic community was greatly reduced.

The density of infauna within the pit was less than half of the density for the entire study area. The exception to this is the number of taxa, species diversity, and species evenness for two of the five pit stations which were higher than the mean for the entire study. The higher number of taxa, species diversity, and species evenness for two stations within the pit indicates that the pit may be filling in at those locations. If the pit were to be filled to within several feet of the surrounding substrate, the benthic community would resemble that of the surrounding area.

The filling and capping of this area should produce negligible changes in wave and current characteristics in the area. With an overlaying cover of coarse sand, it is probable that a stable cap would not erode and disperse the contained fill beneath. There appears to be low potential for water quality impacts if appropriate capping procedures are followed.

The area appears not to be ecologically significant. With the filling of the pit, the area would gradually return to an ecological environment similar to other areas along the coast. Extensive hard clam and oyster beds lie in close proximity to the pit. Care in handling and timing of disposal should minimize impacts to these resources.

With the existing proposal and the low numbers of organisms, the only additional studies required would be to assure that disposal methodologies would contain all pollutants within the pit.

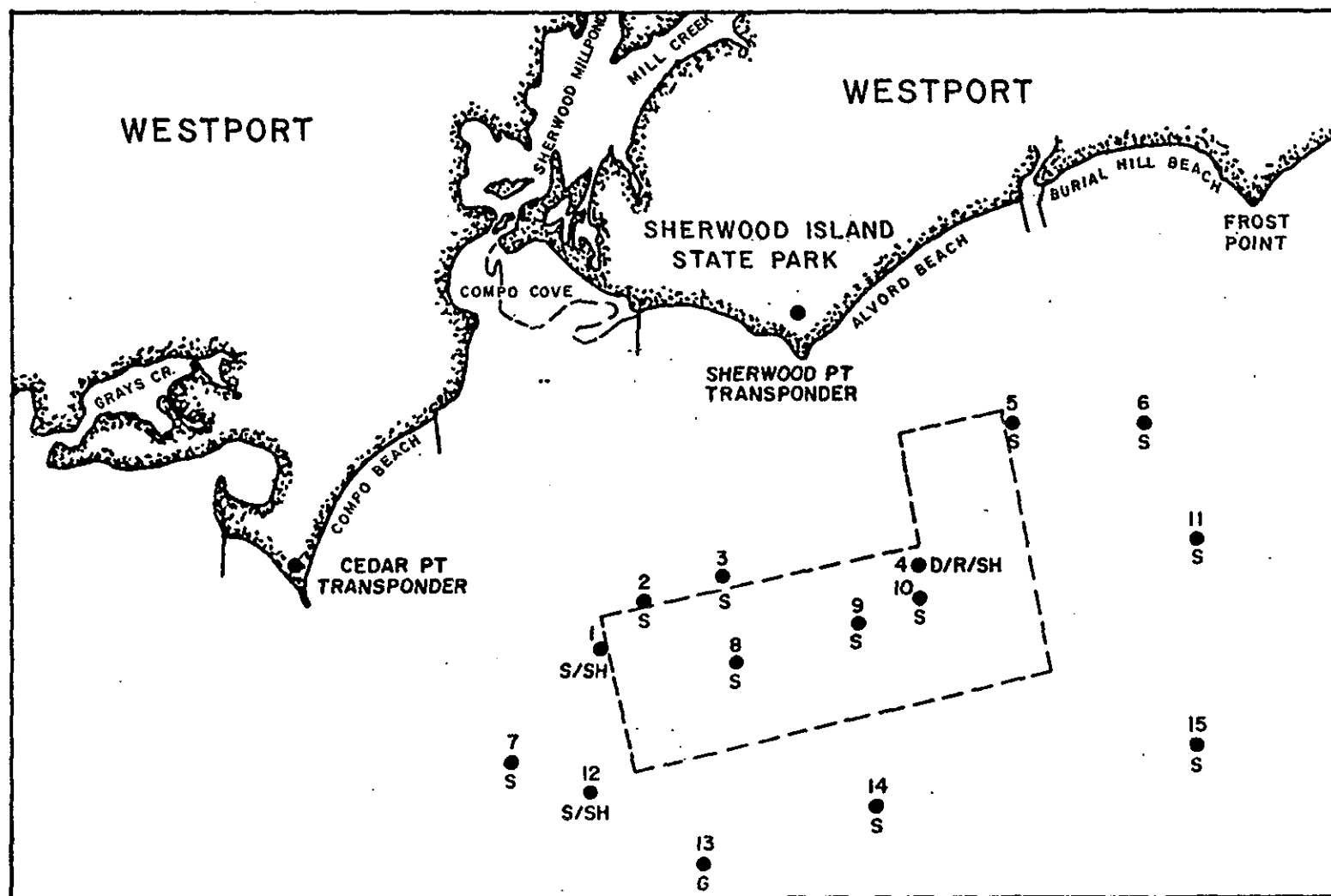


Figure 8 Station locations and sediment types at the Sherwood Island Borrow Pit Site, July 1983. D: detritus; G: gravel; R: rock; Sh: shell debris; S: silt.

CONCLUSIONS

AND

RECOMMENDATIONS

CONCLUSIONS AND RECOMMENDATIONS

Discussion of Results

This study determined that general resource maps and screening information provide a valuable start to analyzing environmental and engineering aspects of containment sites. However, the LIS coastline exhibits considerable variation, so that progressively more detail is needed to test project feasibility. For instance, a site on the Thames River in New London, Connecticut seemed optimally situated for a containment facility. However, examination of existing data records indicated very poor foundation conditions so as to make any construction infeasible. In other areas such as Clinton Harbor, it was only when subsurface explorations were completed that soft, silty sands were discovered which required special, more costly design considerations.

Similar variations exist with regard to environmental resources. Potential facility locations that were identified based on shellfish resource maps were found to be completely unacceptable by local interests. In other instances, environmental sampling and testing indicated that even in areas with generally high environmental value, there are pockets of lesser biological activity where containment facilities could be sited without major impacts.

The actual location of potential containment facilities plays an important role in determining their economic feasibility. With sites located adjacent to, or within 1 mile of, the dredging location, it is feasible to use a hydraulic dredging operation at a savings over a bucket/scow operation. Therefore, Clinton tested out marginally feasible, while other sites were far from feasible. However, as evidenced by the analysis at Milford, assuming hydraulic dredging does not guarantee economic feasibility.

Data obtained during this study are found in a series of reports covering major topics such as site screening, socioeconomic studies, environmental studies and engineering studies. These reports are listed in this report in the section on "Related Reports and Programs". They provide a starting point for any future consideration of containment in LIS and more specific information for the five sites studied in detail. Of course, updates and more detailed studies would be necessary if any site progressed toward implementation. For instance, no formal environmental reports or review procedures have been conducted to date since there are no project proposals associated with this study.

CONCLUSIONS

The containment study has generated considerable public interest, in part because the Sound touches the lives of many people, and also because the disposal of dredged material has been a long standing and emotional issue in the region. Reaction to the study was generally favorable on the part of those who were seeking alternatives to the present disposal scheme. Public involvement continued very high during the site identification and screening phase of the study. During this process, a considerable amount of negative reaction evolved as people reacted to siting of facilities in their harbors.

The study process identified over 300 potential containment sites. These were screened based on technical criteria and public input resulting in 22 sites which were given individual consideration. A summary of these sites is shown in table 20.

This study verified that the public and resource agencies feel very strongly toward protecting environmental resources that are present along the LIS coastline. In our experience, more often than not, siting of a containment facility was rejected because of environmental resources - especially shellfish areas.

There were instances where public attitudes, project economics and environmental considerations did come together in favorable combinations. Of the sites studied in detail, Clinton Harbor initially exhibited the highest degree of such positive results. The project competed favorably economically, could provide environmental benefits, and generated public support. However, the outlook for the project remains dim because of conflicts with federal barrier beach legislation, aquaculture plans, and the State designated natural area at Hammonasset State Park. The summary of findings at Clinton and at the other sites studied in detail is shown in table 21.

The disposal of dredged material in containment facilities is likely to incur additional costs for local interests. In situations when dredged materials are used for wetland creation, beach nourishment or land reclamation, local interests provide without cost to the United States all suitable areas for initial and subsequent disposal, including all necessary retaining dikes. The current cost-sharing policy for Federal maintenance of waterways and harbors favor a town decision to stay with open-water disposal as it requires no local cost-sharing nor other capital expenditures. This economic incentive is not available to private dredging interests.

The findings of this study conclude that under present conditions containment is not a feasible alternative for the disposal of dredged material in Long Island Sound. This does not rule out the need or desirability to evaluate the use of containment on a local case-by-case basis. Nor does it rule out possibilities where containment may be the optimal disposal solution, for example, when dredged material does not meet ocean dumping criteria or when it must be capped if ocean disposed.

TABLE 20
SITES SELECTED FOR INDIVIDUAL INVESTIGATION
SUMMARY OF EVALUATION CRITERIA

<u>Number</u>	<u>Site</u>	<u>Location</u>	<u>Technical</u>	<u>Environmental</u>	<u>Economic</u>	<u>Social</u>
1.	Captains Harbor	Greenwich Conn. - 1.25 miles offshore	Feasible, but limited size, high erosion forces.	Open water and islands high biological productivity.	N/E	Opposed by coastal residents.
2.	Norwalk Island	Norwalk Harbor, Conn.	Increased navigation hazards.	High biological productivity and concentrations of finfish and shellfish. Barrier island designation.	Near dredging operations.	Public concerns over environmental value and nearby recreation.
3.	Milford Point	Milford, Conn. at mouth of Housatonic River	No problems identified.	Important wildlife habitat and natural area. Designated barrier beach.	Adjacent to Housatonic River dredging.	Identified by local officials.
4.	Thimble Islands	Branford, Conn. - Offshore Island	Limited size potential.	High biological productivity and shellfish concentrations.	N/E	Very strong opposition because of environmental values and residential and recreational land use.
5.	Falkner Island	Guilford, Conn. - 2.5 miles offshore	High wave energy zone.	National Wildlife Refuge area. Important shore-bird and reef habitat.	Costly	Away from major social impacts.
6.	Six Mile Reef	Clinton, Conn. - 3 miles offshore	High wave energy zone. Increase navigation hazard.	High concentration of shellfish and finfish.	Costly	Mixed support and opposition.
7.	Duck Island Roads	Clinton and Westbrook, Conn.	Tied to existing breakwater.	Undocumented oyster and lobster area.	Close to small recreational harbors.	Adjacent to existing harbor of refuge.
8.	Menunketesuck	Westwood, Conn.	Capacity limited by shallow water depth.	High biological productivity and concentration of shellfish and finfish. Least tern habitat.	Close to small recreational harbors.	Concerns over loss of habitat and proximity to town beaches.

TABLE 20 (Continued)
SITES SELECTED FOR INDIVIDUAL INVESTIGATION
SUMMARY OF EVALUATION CRITERIA

<u>Number</u>	<u>Site</u>	<u>Location</u>	<u>Technical</u>	<u>Environmental</u>	<u>Economic</u>	<u>Social</u>
9.	Bartlett Reef	Waterford, Conn. - 850 yards offshore	High wave energy zone.	High biological productivity and concentrations of shellfish and finfish.	Close to New London and Niantic Harbors.	Concerns over loss of habitat.
10.	Stratford Shoals	At "Middle Ground" off Stratford, Conn.	High Energy Zone	High biological productivity. Sizeable populations of lobster and finfish.	Costly	Concerns from recreational fishermen.
11.	Black Ledge	Groton, Conn. - 1 mile offshore	High energy area. Solid foundation.	Productive benthic habitat.	Costly. Potential for regional use.	Identified by Groton Conservation and Harbor Commission.
12.	Clinton Harbor	Clinton, Conn. - Adjacent to Clinton Harbor.	Soft, but adequate foundation.	Potential extension of the Hammonasset marsh.	Favorable.	Strongly supported by town of Groton and private marinas.
13.	Fayerweather Island	Bridgeport, Conn.	Moderate wave exposure, silt and sand foundation.	Important seed oyster cultivation area.	Located adjacent to dredging.	Strong opposition from nearby residents. Adjacent to Seaside Park.
14.	Yellow Hill Channel	Bridgeport, Conn.	Weak, but adequate foundation, protected from waves.	Degraded, low fish and wildlife values.	Change from marine to non-marine use.	Potential for park development. City officials opted for other use.
15.	Two Tree Island	Waterford, Conn. - 1 mile offshore.	Rock outcrop. High energy area. Close to Millstone Nuclear Power Plant.	Significant shellfish and finfish area. Natural waterfowl refuge.	Close to New London and Niantic Harbors.	Nearby beach and concern over possible impact on nuclear plant.
16.	Borrow Pits in LIS	Along LIS coast at Sherwood Island, Westport; Morris Cove, New Haven; Prospect Beach, New Haven.	No construction needed.	Conditions in hole are generally anaerobic. Surrounding area productive.	No construction cost.	Not evaluated.
17.	Mamaroneck Harbor	Rye, N.Y.	Multiple sites. High energy area.	Excellent habitat for shellfish and finfish.	Close to dredging site.	Strong opposition from nearby residents.

TABLE 20 (Continued)
SITES SELECTED FOR INDIVIDUAL INVESTIGATION
SUMMARY OF EVALUATION CRITERIA

<u>Number</u>	<u>Site</u>	<u>Location</u>	<u>Technical</u>	<u>Environmental</u>	<u>Economic</u>	<u>Social</u>
18.	Gold Star Bridge	New London, Conn. on Thames River	Very poor foundation. Protected from waves.	Currently supports shellfish population and shoreline fishing activity.	Adjacent to Federal channel.	Identified by Conn. Dept. of Transportation.
19.	Penfield Reef	Fairfield, Conn.	High energy area. Rock outcrops.	Nearby areas are highly productive.	Costly. Local or regional site.	Identified by Fairfield Conservation Commission. Could provide flood and beach protection.
20.	Mianus River	Greenwich, Conn.	Small local disposal site - infrequent dredging and use.	Not evaluated.	Not evaluated.	Identified by local officials.
21.	Milford Harbor	Milford, Conn. - in outer harbor area.	Sites considered on east and west side of Federal channel. Moderate wave energy.	Heavy waterfowl use in area. Lobster and clam population.	Adjacent to dredging area.	Identified by town of Milford officials. Adjacent to town beach.
22.	Flushing Bay	New York, N.Y.	(The New York District of the Corps of Engineers is currently studying this site.)			

TABLE 21
PROTOTYPE SITES SELECTED FOR DETAILED ANALYSIS

Criteria	Clinton Harbor	Black Ledge	Penfield Reef	Milford Harbor	Sherwood Borrow Pit
PROJECT DESCRIPTION					
Type	Marsh Creation	Island Creation	Shoreline Extension	Shoreline Extension	Aqueous Borrow Pit
Capacity (cy)	1,000,000	7,500,000	4,300,000	400,000	750,000
Years to Fill (yrs)	25+	50	24	50	50
Dike	Rock	Rock	Rock	Rock	None
Size (acres)	100	125	300	11	100
Waves	High Energy	High Energy	High Energy	Moderate Energy	Moderate
Foundation	Granular over very soft organic silt.	Rock and loose silty sand.	Sand, silt, gravel.	Loose to dense granular.	Granular.
Operation	Hydraulic dredging.	Bucket & scow w/offload.	Local: hydraulic dredge >2 miles: bucket & scow	Hydraulic dredging	Bucket & scow
ECONOMICS					
Initial Cost	\$1,962,000	\$40,385,000	\$11,820,000	\$2,612,000	None
Annual Cost	\$543,000	\$4,812,000	\$3,792,000	\$378,000	No evaluated
Annual Costs of Alt.					
Open Water	Cornfield - \$499,000 New Haven - \$580,000	New Haven - \$1,281,000	New Haven - \$2,382,000	New Haven - \$253,000	Not evaluated
Ocean	The Race - \$621,000	The Race - \$1,281,000	The Race - \$2,931,000	The Race - \$279,000	Not evaluated
ENVIRONMENTAL					
Shellfish	Low populations.	Extensive blue mussel bed.	Large population of oysters, clams, lobsters, blue mussels.	Population of lobsters & crabs.	Adjacent population of clams & oysters.
Finfish	Low population.	Commercial & recreation species.	Large population.	Not evaluated.	Adjacent sport fishery.
Biological Resource Value	Medium	High	High	Not evaluated	Low
Significant Resources	Adjacent Hammonasset marsh, potential aquaculture area, barrier beach designation.	Rock habitat.	Large shellfish and fish population. Heavy use by waterfowl.	No evaluated	Adjacent commercial and recreational fisheries.

TABLE 21 (Continued)
 PROTOTYPE SITES SELECTED FOR DETAILED ANALYSIS

<u>Criteria</u>	<u>Clinton Harbor</u>	<u>Black Ledge</u>	<u>Penfield Reef</u>	<u>Milford Harbor</u>	<u>Sherwood Borrow Pit</u>
Major Impacts	Loss of existing habitat, changes in circulation and sedimentation patterns, expansion of marsh area.	Loss of existing habitat, island added to seascape, changes in circulation pattern, potential marsh habitat creation.	Loss of existing habitat, changes in circulation and sedimentation pattern.	Loss of habitat, interruption of tidal currents and coastal erosion.	Restore habitat to that in surrounding areas.
SOCIAL					
Land Use	Adjacent marsh	Provide wave protection to shore.	Nearby residential area.	Nearby residential area.	1,000 feet offshore.
Recreation	Adjacent State park.		Adjacent beaches.	Adjacent beaches.	Sherwood State Park.
Public Opinion	Strong support from town of Clinton and private marinas. Objection by town of Madison Shellfish Commission. Concerns expressed by State of CT.	Identified by Conservation Commission. Opposed by shoreline residents.	Identified by Fairfield Conservation Commission. Provide wave protection and beach nourishment.	Identified by town of Milford.	Suggested by State of Conn., Aquaculture Division.

The use of the aqueous borrow pits along the coast likewise looks feasible. They require no construction and have costs similar to open water disposal. However, shoreline interests express concern over possible impacts to recreational and environmental resources. While these areas deserve further consideration, they also require further analysis and public input.

This study has concluded that critical factors including economics, environmental and public inputs rule out widespread reliance on containment for the disposal of dredged material in LIS. Further, we concluded that there is an apparent general acceptance of current disposal options - namely open-water disposal and continued use of the closely monitored four designated sites, with land disposal in some specific instances where possible. Economic analysis of containment facilities reveals that it is more costly than other disposal alternatives although substantial savings in dredging costs could be realized if a containment facility were placed adjacent to the dredging location. In such cases the use of hydraulic dredging operations are feasible at less expense than the more commonly used bucket/scow operation.

Although this study was able to identify potential sites for containment facility projects, current dredging and disposal operations are favored over containment alternatives not only on an economic and sometimes environmental basis but also because of public inputs and interests.

RECOMMENDATIONS


I have reviewed and evaluated the information and findings in this report and other documents concerning dredged material disposal in Long Island Sound (LIS). I have met with and considered the view of local officials, other agencies and LIS interests.

Accordingly, I recommend no Federal interest at this time in the implementation of containment facilities for the disposal of dredged material in LIS.

I base this recommendation on the findings that containment facilities are generally not cost effective, nor socially or environmentally acceptable. Also they do not carry widespread local support needed to commit substantial local financial resources that are not required for ocean disposal under current policies.

23 Sep 85

DATE



THOMAS A. RHEN
Colonel, Corps of Engineers
Division Engineer

PUBLIC REVIEW

AND

COMMENTS

ATTACHMENT 1
Public Review and Comments

The New England Division (NED) distributed about 250 copies of the Public Review Draft of this report dated June 1985. A public announcement which summarized the status and findings of the study was distributed to those receiving the report plus an additional 250 groups or persons. Comments or information were received from the following:

Congressman Robert J. Mrazek	(3rd Dist - NY)
State of Connecticut	
Robert C. King	Oakdale, CT
Southeastern Connecticut RPA	Norwich, CT
City of Groton, CT	Conservation Commission
State Representative Philip H. Tuthill	Groton, CT
The Long Island Sound Task Force of the Oceanic Society	
State Historic Preservation Office for Connecticut	
State of Connecticut Natural Resources Center, DEP	
Christopher Percy	Waterford, CT
Southwestern (CT) RPA	East Norwalk, CT
U.S. Environmental Protection Agency, Region II	New York, NY
U.S. Dept of HUD	Boston, MA
U.S. Fish and Wildlife Service	Concord, NH

1/ These letters are reproduced at the end of this section. The U.S. Fish and Wildlife letter was actually based on an earlier review draft and was included as an attachment in the Public Review Draft. Responses to these letters are provided below. If the same issue is raised by more than one individual, reference is made to other sections. Where appropriate, changes have been made in the report.

Congressman Robert J. Mrazek 3rd District NY

Your letter of August 6, 1985 expressed concerns over dredged material disposal in Long Island Sound. Before responding directly to your comments, it may be helpful to review the procedures followed in evaluating and managing dredging projects. Although somewhat lengthy, this discussion is relevant, in part because it outlines the technical basis for some of the responses.

Most of the processes mentioned here are directed or performed by the NED Dredged Material Management Section. Located in the Regulatory Branch, the Section evaluates -- and applies these review and monitoring procedures to -- both Corps and Corps-regulated projects in Long Island Sound. The Section itself is somewhat unique within the Corps in terms of its title and the nature and emphasis of its work. It is staffed by professionals of varied disciplines representing the biological and physical sciences, as well as engineering.

1/Two letters were received after preparation of original report:
U.S. Coast Guard - 3rd District New York, New York
State of New York Albany, New York

Some of the factors the section considers in evaluating each dredging project include: the project's disposal options based on environmental and economic considerations; the proposed method and time of dredging; environmental conditions at and near the proposed disposal site; and, the nature of the material to be dredged and the likelihood that it includes contaminants. In characterizing the material to be dredged, many factors are considered, among them: potential routes of contamination to the dredging site -- e.g., natural drainage patterns in the area, the presence of any outfalls in the vicinity, and the area's hydrology; any previous or current sediment-test data for other Federal or non-Federal projects nearby; the extent of any historical or current industrial activity in or around the site; and any spills of oil or other substances that have occurred in the area.

Sampling and testing of the sediments to be dredged are typically ordered, with the location, depth, and method of sampling, as well as the method of testing, closely monitored. Grain-size analyses and bulk chemistry tests are required, as a minimum, in most cases. Elutriate and biological tests are also employed. Among the parameters routinely checked are volatile solids, water content, oil and grease, metals, and PCB's.

Each project is announced via a public notice that invites and typically allows 30 days for comments. Anyone who wishes to receive these notices will be added to the mailing list. All projects are also closely coordinated with EPA, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, all of whom receive sediment testing results. State concurrence in the form of State permits and water quality and coastal zone management certifications is also required. The special conditions that are routinely imposed on dredging projects provide additional safeguards; examples include restrictions on the type of dredging equipment used, seasonal restrictions, capping, and a variety of conditions to assure accurate placement.

Finally, the controls extend well beyond the issuance of the permit or the award of the dredging contract: All open-water disposal is inspected by an onboard Corps representative. As added precautions, buoys are maintained at the designated sites, and precise coordinates are stipulated for the approved disposal point. Violations are aggressively pursued, with substantial fines having been paid in some cases. In addition, the NED Disposal Area Monitoring System (DAMOS), formally in place for eight years now, monitors the open-water disposal sites for physical, chemical, and biological effects and is widely considered the most advanced and comprehensive monitoring program of its kind in the Nation. The program employs bathymetric surveys, side scan sonar, underwater photography, divers, sediment analyses, biological analyses, and submersible vessels, among other techniques. University scientists, recognized experts in their fields, are active participants.

Research performed by the Corps' Waterways Experiment Station (WES) is also available, including the findings of its five-year, nearly \$33 million Dredged Material Research Program. Some 70% of that program's research was actually performed by universities, firms and institutions. Close contact is also maintained with WES on other dredging-related research, including the Field Verification Program, where this Division is a partner with WES and EPA in the research effort to evaluate (and improve if necessary) the predictive accuracy of the laboratory tests used in assessing material to be dredged.

In short, considerable effort has gone into the establishment of a system of controls that accords careful attention to each phase of the process -- project evaluation, coordination, publicity, inspection, enforcement, scientific monitoring, and research. This system is comprehensive and incorporates many safeguards. In fact, one could easily argue that the controls are excessive, in view of the monitoring and research results. In any event, our efforts in this area are being continuously assessed and ideas for refining it are invited. One example of this is the DAMOS Symposium held in January, where over 100 scientists, regulators, and citizens contributed their thoughts on that program's techniques and approaches.

Dredged material containment areas (DMCA) have been employed in several regions of the country (e.g., Great Lakes, Chesapeake Bay). The intent of the dredged material containment study was to provide information on the feasibility of containment within Long Island Sound so that regulators could make decisions as to the most appropriate option for dredged material disposal; it does not rule out containment for future operations. Rather, the New England Division, as well as the entire Corps of Engineers, subscribes to the concept that there is no single "best" disposal choice or alternative, and continues to examine each project on an individual basis to determine the most appropriate option for that particular project.

While stating that the containment option remains open for consideration, it is important to note that the basic conclusions of the study remain valid, i.e., containment is often expensive and controversial, and often has its own particular environmental concerns. The New England Division recognizes that open water disposal also remains controversial in some areas. The steps outlined earlier have been implemented, to insure that all disposal operations are evaluated, managed, and monitored for their environmental impact and that the results of and the opportunity to influence these processes are made available to interested parties.

With regard to the will of Congress concerning open-water disposal and the quote from the booklet published by the New York District, it is stated that no one alternative is "best" and that all options, including open-water disposal, should be considered. This has been and remains the policy of the New England Division, and the Regulatory Branch of the Division continues to examine and review disposal permit requests in this light.

Several paragraphs in your letter make reference to classification of dredged material and judgements on the effects that could occur through open-water disposal, with particular reference to water quality impacts. All dredged material considered for disposal in New England waters is subjected to evaluation through the procedures described earlier.

With respect to water quality impact, numerous measurements in the vicinity of dredged material disposal plumes in New England have demonstrated time and again that the impact of disposal is minimal and of short duration, as long as the sediment remains in the salt water of the marine environment where the forces acting to bind the contaminants to the sediment are effective. Comparisons of fresh water disposal in Minnesota to open-water disposal in the marine environment are not appropriate in this regard.

The evaluation and management procedures described earlier are relevant to the capping operations referred to in your comments. Under certain circumstances capping is considered a viable alternative to unrestricted open-water disposal and, when this alternative is selected, the capping material is always substantially less contaminated than the material to be covered, and could not be considered a threat to the environment. Your concerns regarding the accurate placement of dredged material during the capping operation are similar to those expressed by others. The NED policy of requiring inspection by a government representative during open water disposal operations was adopted in part for this reason. This inspection program was recently reinforced through reorganization and assignment of an Inspection Coordinator, whose responsibilities include training the inspectors. In conjunction with our enforcement program that involves stiff penalties, these measures provide a significant deterrent to "short dumping." Dredging firms in the region have been made aware of them. Anyone who has evidence of violations is encouraged to report it to us. All such reports have received follow up action as was demonstrated in the New London area this past year.

Placement of the material that will be capped is the most important aspect of the entire project, and a great deal of effort is expended to insure tight control of disposal. Taut wire buoys are used to mark the location, and disposal is restricted to a specified radius from an essentially motionless scow. Depth surveys, conducted following such disposal operations, have shown that these procedures are successful in reducing the spread of material. When capping takes place, a much greater volume of material is used (typically two or three times the volume of the base material) and the sediment used for capping is spread over a larger area to insure complete coverage. In this case, precise control is not as critical and a distribution of disposal points around the buoy is encouraged; again, comprehensive surveys are performed after capping to insure that the base material has been successfully covered.

Capping, while not the only solution to disposal, has proven to be a successful procedure, particularly in Long Island Sound and the New York Bight. The incident with Hurricane David is, in fact, an example of the effectiveness of the procedure. This storm occurred within a few months after disposal, before the mound had sufficient time to stabilize and consolidate; consequently, there was some loss of capping material and rapid settling of the mound associated with the hurricane. However, the cap acted as expected, and no covered material was exposed as a result of the storm. Since that time, subsequent surveys over the past six years have shown the deposit is stable and essentially unchanged, even though storms of similar magnitude have been experienced.

The incident involving the buoy at the New London site deserves clarification. The disposal buoy, even after being relocated, remained within the designated disposal area. The vessel that was involved apparently used the disposal buoy as a navigational reference rather than avoiding it as would be expected.

Regarding a quote from the Mitre Corporation report on conditions in the New York Bight, the area has a long history of use for disposal of sewage and a host of chemical wastes. There is no evidence to implicate dredged material as the cause of the Bight's pollution.

There is no scientific basis for concluding that there is overwhelming evidence that dredged material disposal can seriously impact receiving ocean waters. That conclusion is a common preconception, that is directly contradicted, in fact, by monitoring and research results. This is evident in many areas, including the Western Long Island Sound Disposal Area. Since use of that disposal area began in 1982, nearly \$400,000 has been expended in DAMOS monitoring of the site and its environs. The results show that disposal has been accurately controlled, forming a mound which has remained stable with no indication of erosion. Physically, the dredged material is coarser than the surrounding fine silts which characterized the predisposal bottom. Levels of contaminants found on the mound have been similar or less than those found in surrounding areas. Recolonization by marine organisms has been clearly evident, and rapid improvement in habitat has occurred. Onsite bioaccumulation monitoring using caged mussels has shown no contaminant uptake. These results are consistent with those obtained at other disposal sites in Long Island Sound and elsewhere in New England.

Another common misconception exists regarding mobilization of contaminants from sediments into food chains. A text edited by Harris H. White published in 1984 entitled "Concepts in Marine Pollution Measurements" is pertinent here. It includes several papers addressing contaminant sampling and measurements in the water column, sediment, and biota. Of particular interest to the Corps in relation to monitoring the environmental impact of dredged material disposal is the issue of bio-magnification, that process by which the tissue concentrations of bioaccumulated chemical residues increase as these materials pass up the

food chain through two or more trophic levels. Extensive literature reviews sponsored by both the Corps (Kay, 1984) and EPA (Biddinger and Gloss, 1984) indicated that heavy metals and organics do not biomagnify either in freshwater or marine food webs, with the exception of methylmercury. Also, the magnitude of increase for methylmercury is on the order of 1 - 10 times, not 100-1000 times as may occur in nonaquatic food webs. This contradicts the widespread public opinion that all or most pollutants will biomagnify to potentially dangerous concentrations in marine food webs.

With respect to physical impacts, the relative scale of disposal operations needs to be kept in perspective. A typical disposal mound a few meters high and a few hundred meters in diameter is a very small feature in an oceanographic context, and cannot alter circulation patterns or flushing rates in a body of water such as Long Island Sound (1300 square miles). Similarly, studies in Long Island Sound and elsewhere have shown that dredged material descends rapidly through the water column during disposal, with only some 1-5% of the total mass remaining in suspension for only a few hours at most. In the instance of Galveston Bay, the disposal strategy was, in fact, to maximize dispersal of the uncontaminated sediments involved, to minimize impacts. With the exception of the Cornfield Shoals Disposal Site, which serves as a "dispersal" site and is managed accordingly, the disposal sites in Long Island Sound are low-energy containment sites. Baseline oceanographic surveys led to this characterization and DAMOS has confirmed it, in that extensive DAMOS surveys at these sites have shown conclusively that the disposal mounds have remained stable for many years.

Concern for any possible effect that dredged material disposal in Long Island Sound might have on Long Island's drinking water is unwarranted from a scientific standpoint. As mentioned earlier, the majority of any contaminants in dredged material in the marine environment are tightly bound to the sediment particles and are not susceptible to migration. Moreover, the medium that would serve as the carrier of contaminants -- whatever interstitial water is present within the mound -- tends to leach upward as consolidation pressures on the mound's deeper sediments leave them less porous than those on the surface of the mound.

Regarding WES research, it has a long history of internal and external peer review. In 1984, for example, nine investigators in the WES Environmental Laboratory conducted work on the EPA/Corps Field Verification Program (FVP) and the Long-Term Effects of Dredging Operations Program. They published 33 research papers in peer-reviewed technical reports, journals, proceedings, and texts for an average of more than three peer-reviewed research publications per year by each scientist. In 1985, this group completed a total of eight technical reports for joint publication with EPA authors. Twenty-four external scientists, six of international status, provided peer review of this work. Additionally, 15-20 individual manuscripts authored by EPA scientists on the FVP research are in preparation, in press, or have been published in peer-

reviewed professional journals or proceedings of national and international symposia.

I hope this explanation of the programs and studies that this Division has undertaken in the sensitive area of dredged material disposal has been informative.

State of Connecticut

We have reviewed your comments and recommendations and offer the following discussion.

In regard to the present open water disposal sites, NED has traditionally not assigned specific numbers to the capacity or expected life expectancy. There are, of course, many variables and ever changing conditions which would need to be reflected in such a determination. The capacity, while not infinite, is sufficient to meet disposal needs beyond the 50-year (1985-2035) planning period of this study. A statement in the report text has been added to reflect this.

We concur with your observations related to the specific sites at Milford, Clinton, Penfield and Sherwood and also with your concerns on the need to address potential impacts associated with any future consideration of containment activities.

Robert King, Oakdale, CT

Your letter provides interesting historical background and raises several points regarding the Black Ledge containment site and disposal of dredged material in general. The containment study did indicate that disposal at Black Ledge would be about four times more costly than open water disposal and would impact on about 150 acres of productive environmental habitat. The containment structure would consist of a substantial rock dike with a top elevation of +13.5 MLW. While a 6-foot design wave might be expected to overtop the dike during major storms, there would not be any significant overflow of material into the surrounding channel area.

Regarding the possibility of other disposal areas, it is Corps policy to seek maximum practicable benefits through productive use of the materials dredged from the nation's ports and harbors, provided such use is in the public interest. The designation of disposal areas is determined on a project specific basis considering economics and environmental consequences. Currently, when disposed of in open water, dredged material from the Groton/New London and surrounding areas is deposited at the New London disposal area.

City of Groton, CT Conservation Commission
State Representative Philip H. Tuthill Groton, CT

Most of your concerns regarding open water disposal practices, monitoring, and short-term and long-term impacts are discussed in the response to Congressman Robert J. Mrazek.

In regard to the feasibility of the Black Ledge containment facility, with a first cost of \$40,000,000 and annual costs that are 4 times that of open water disposal, a project at this location could not be justified. This project would also impact on about 150 acres of productive benthic habitat supporting a diversity of species and dense concentrations of blue mussels.

Concerning the question of funding for a LIS containment system, as stated in the report, the general policy of the Corps is to require local interests to provide without cost to the United States all suitable areas required for initial and subsequent disposal of dredged material and all necessary retaining dikes, bulkheads and embankments. In these times of fiscal constraint it is felt that the federal government would not be willing to change this policy and fund the construction of a containment facility.

Long Island Sound Task Force of the Oceanic Society

The New England Division is cognizant of the potential impacts of the disposal of dredged material and is conducting continuous monitoring of disposal sites and marine life. These studies are described in the response to Congressman Mrazek.

The Corps is not adverse to using dredged material for marsh creation or restoration. In fact it is Corps policy to seek maximum beneficial use of the material. For any federal dredging project alternative disposal areas are considered on a case-by-case basis. Ultimately however, the provision of such disposal areas is the responsibility of local interests.

Southwestern (CT) Regional Planning Agency

The containment study looked at the possibility of using the Sherwood borrow pit and other such areas at the suggestion of the Aquaculture Division of the CT Department of Agriculture. Actually, the site could be considered for use as a disposal area at any time. Study findings did verify that anoxic conditions exist in the borrow pit and that the benthic community and other life forms were greatly reduced. Filling and capping would return the area to an ecological environment similar to surrounding areas. The study recognizes the potential impact on nearby environmental and recreational resources which are identified on Figure 8. These areas could meet local disposal needs but as the report states they would require additional analysis and public input.

U.S. Environmental Protection Agency Region II New York, NY

The language in the report has been clarified to reflect the finding that the use of the Sherwood and other borrow areas is a worthwhile consideration. These sites entail no construction costs, a factor which makes them economically competitive with open water disposal. However, based on surrounding environmental resources and recreation areas, additional analysis and public input would be necessary. (See letter from SWCT RPA). As further stated in the report, these sites could meet disposal needs for small harbors such as the Westport/Southport area, but they do not exist in sufficient numbers to meet disposal needs for the LIS region.

In reference to the Clinton Harbor site the discussion has been expanded to describe the federal barrier beach legislation and the State designated natural area at Hammonasset State Park. The natural area and the barrier beach have been added on Figure 4.

Its correct that the Clinton site is economically competitive (specifically as stated in the report, it is 9 percent more costly than disposal at the presently used Cornfield Shoals site but would be 7 percent less costly than disposal at New Haven). Both the town of Clinton and local private interests have been supportive of locating a containment facility in the outer harbor area. However, the town is unable to give this project high enough priority to justify the \$2,000,000 local cost in light of other town projects. Local private interests also explored the possibility of financial participation. Any development plan would have to deal with the federal barrier beach and State Natural area provisions and restrictions. The federal barrier beach designation restricts federal participation and limits development activity in general. In addition, the State of Connecticut feels that the Hammonasset marsh area is considered an outstanding example of habitat considered critical in the state and has designated the area as a Natural Area Preserve. (See CT DEP letter) Activities such as dredging and filling are prohibited.

U.S. Fish and Wildlife Report

As you have summarized in your letter, the study has shown that under present conditions, critical factors including economics, environmental and public inputs rule out widespread reliance on containment. The study has not ruled out the use of containment facilities in LIS but rather has encouraged their consideration on a case-by-case basis.

The economic analysis for the study was approached according to the specific situation in LIS. Here, three different alternatives (open water LIS, open water-ocean, and containment) were available to reach the same objective - to properly dispose of dredged material. Therefore, to correctly represent the economics of disposal, each alternative was analyzed and compared with each other. The LIS situation is different than in the Great Lakes where EPA policy ruled out open water disposal as an alternative for all but the cleanest of material.



CONGRESS OF THE UNITED STATES
HOUSE OF REPRESENTATIVES
WASHINGTON, D.C. 20515

ROBERT J. MRAZEK
3RD DISTRICT, NEW YORK

COMMITTEE ON
APPROPRIATIONS
WHIP AT LARGE

August 6, 1985

Colonel Carl B. Sciple
Division Engineer
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02254-9149

ATTN: NEDPL-BC

Dear Colonel Sciple:

I am writing in regard to the public announcement of July 3rd, 1985, regarding the completion of the feasibility study of dredged material containment for Long Island Sound. This letter is intended to serve as my formal comment concerning the draft report released by your office. It is my hope that you will consider the various points I raise as part of the public record in preparing the final report.

As you know, the study was conducted in response to a congressional resolution adopted on May 10th, 1977, by the House Committee on Public Works and Transportation. First, I feel that the study should have focused more attention on the long term effects of open water disposal in Long Island Sound.

Since the absence of containment facilities has necessarily led to an increasing dependence on open water disposal, the environmental impact of both disposal methods should be addressed in accessing the cost/benefit feasibility of containment. At various public hearings, this concern was expressed by Nassau and Suffolk County public health officials, as well as by several of the towns on the north shore of Long Island. If the Army Corps concludes that there is no viable federal role in containment, this will leave open water disposal for all categories of sediment, as the only viable alternative.

While the report contends that containment is too expensive and too politically controversial, open water disposal is equally controversial at least among the residents of Long Island which I represent.

I believe that the decision to make open water dumping the sole option available for the disposal of dredged spoils, is environmentally unsound. In Section 403 of the Clean Water Act, the last clause reads that if the effects of any pollutants are not known, or if a reasonable judgement of such effects can not be made, then no open water dumping permit should be issued.

The Marine Protection, Research, and Sanctuaries Act* of October 23, 1972, states that dumping should not reasonably degrade or endanger

*(PL92-532, 86Stat. 1052;33 USC. 1401 et seq.; as amended.. Section 103..)

Colonel Sciple
August 6, 1985
Page 2

human health, welfare, the marine environment, or economic potentialities. It is clearly the will of Congress that, if there is any doubt about potential impact other more acceptable alternatives should be sought out. I believe that there is considerable doubt as to the potential long range effects of open water dumping, and that the Army Corp; should address these environmental concerns in the final published report instead of implying that open water dumping is the most optimal option available.

Recognition of the threat of environmental degradation for estuaries and coastal zones by dredging and disposal was manifest in the report submitted by the Council on Environmental Quality in October 1970, which recommended that ocean dumping of polluted dredge spoils be discontinued as soon as suitable alternatives can be employed. Also, the disposal of nonpolluted spoils should be regulated to avoid damage to estuarine and coastal systems (US council on Environmental Quality 1970). In 1975, the Minnesota Pollution Control Agency investigated the dredging activities of the US Army Corps of Engineers in the Dutch Harbor Basin, at the Dutch-Superior Harbor. The primary purpose of this investigation was an assessment of the water quality impacts of the "beach nourishment" disposal techniques used by the division, whereby dredged material was disposed in approximately twelve feet of water in Lake Superior near Minnesota Point. The sediments that were dredged were classified by the EPA as unpolluted.

In a letter written to me dated July 18, 1985, John Pegors, Regional Director of the Minnesota Pollution Control Agency states: "A number of violations of the Minnesota Water quality regulations were verified by the sampling program our agency conducted when open water dumping of dredged spoils occurred. The report states that the turbidity, color, iron, and copper exceeded applicable water quality standards at the disposal site. Five violations of oil and grease standards were noted, three at the dredge site and two at the disposal site. Two samples violated fecal coliform standards at the disposal site. Other parameters that showed a significant increase but did not violate water quality standards included suspended solids, total phosphorus, total chromium, lead, murcury, zinc, soluble phosphorus, cadmium, nickel, and nitrate nitrogen.

Since 1975, the state of Minnesota and the state of Wisconsin have jointly prohibited the open water dumping of dredged spoils by the US Army Corp; of Engineers. The governors of the states both requested the Corp; of Engineers to refrain from open water dumping. However, within the last few years, the Corps has begun to mount a new effort to reinstitute the practice of open water dumping of the dredge water spoils. The Minnesota Pollution Control Agency is fighting this attempt, and with good reason. A more effective system of classification is needed to identify the degree of contamination of dredge spoil. The example of Duluth-Superior Harbor demonstrates that it is not only known polluted spoil which needs to be monitored.

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This problem of the classification of dredge spoil is one of the major reasons I am concerned about the policy of open water dumping, and the assurances that contaminated material will be safely contained by the technique of capping. What is the benefit of a policy for which there is a good possibility that the capped material may be just as much a threat to the environment as the material which is supposed to be contained? Besides the classification of material, there are many other reasons as to why the technology of capping should still be considered in the experimental stage.

In 1979, a hearing was held before the Subcommittee on Natural Resources and Environment, of the Committee on Science and Technology of the House of Representatives. During this hearing, Dr. William A. Muller, a marine biologist said:

"Capping is not the answer, in spite of the claims made by some that the practice will seal in pollution and contain the spoils. Capping poses many problems that could circumvent its apparent usefulness as a toxin-and spoils-containment technology. Studies point out that captains often have a hard time finding the exact dump location. This problem is particularly acute in windy and rough weather. Then to, even though the dump site may truly be located, winds may push the barge off the target during the operation."

The Corps of Engineers assumes that all of the contaminated material will be dumped precisely where specified and properly capped, keeping drift and spread of contaminants to a minimum. Unfortunately, the Corps cannot sufficiently police dredging operations to enforce proper placement of the spoil. Contracts are assigned to the lowest bidder. Some dredge contractors operate on a "shoestring", and cut corners wherever possible. "Short dumping", which involves a failure to transport dredge spoil material to the designated disposal site, is a common and extremely destructive practice by some dredging contractors. The Connecticut Commercial Fisherman's Association claims to have evidence of instances of short dumping in the recent dredging of both Norwalk and Stamford harbors. When contaminated material is dumped without proper regard for the location of the disposal site, it is not unusual for a lobsterman to pull up a line of pots buried in toxic sediment. Moreover, Draggersmen find whole acres of bottom destroyed for fishing.

In an incident earlier this year, a buoy was moved from its correct location marking the New London disposal site. Before this problem was discovered, several loads of dredged material were dumped at the wrong location. When the buoy was moved back to the correct location, the spoil was not removed, and the nuclear submarine, Florida, actually cruised through one of these disposed spoil mounds.

Colonel Sciple
August 6, 1985
Page 4

Commenting on the interim plan for the disposal of dredged material in Long Island Sound, the Oceanic Society went on record saying: "reliance (on capping) may be misplaced despite the fact that we are close to completing the Stamford/New Haven project at the Central Long Island Sound Site. It should be remembered that the capping experiment at the site has yet to experience any sustained period of high energy such as winter storms or hurricanes." Shortly after this comment was made Hurricane David hit the East Coast of the U.S. in the late part of 1979, causing extensive damage to the protective cap at the site.

There are several flaws in the contention that the use of capping makes open water disposal the only desirable option. What is the point of classifying dredge spoil by the level of contamination when it is all going to be disposed of by the very same means? Furthermore, there is no assurance that the material being used for the cap is entirely without risk. I believe it would be wise for the Corps to leave several different options open for the disposal of dredge spoil material so that each classification of dredge spoil can be disposed of in the most environmentally safe way possible. This is the approach that the New York Division has been taking toward the New York Bight. For the past five years they have been studying possible alternatives to open water dumping in an attempt to deal more efficiently with the dredged spoils from New York Harbor.

In the concluding section of a booklet published by the New York District entitled Dredged Material Disposal Alternatives, it says:

"There is no single 'best' disposal choice or alternative. A combination of alternatives based upon different situations will be most effective. There is no reason dredging cannot serve the environment as well as the economy. Our tests have shown that there are alternatives that are environmentally safe that can be established at a reasonable cost. A range of disposal options to handle differing qualities of dredge material is essential for efficient operations."

Unfortunately, the measures being taken now by the New York Division are corrective as well as preventive. The waters of New York Bight, according to a May 1979 technical report by Mitre Corp, are polluted. The study reported that New York Bight waters showed the following evidence of environmental degradation:

"low oxygen levels in bottom waters, particularly near the disposal area; a large fish and shellfish kill in 1976 associated with an algae bloom and extensive areas of oxygen depletion; reduced abundance and diversity of benthic fauna at the mud dump and sewage sludge disposal sites; declining commercial fish harvests; high incidence of fin rot in fish, high incidence of abnormalities in developing fish eggs; and exoskeleton disease and gill lesions in crustaceans collected near, or confined near, disposal areas."

Colonel Sciple
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It is my hope that these same corrective measures do not have to ever be taken in Long Island Sound. But the same approach towards waste material management that has been taken by The New York Division should be taken by the New England Division. Such a practical approach is the only way to address a situation in which too little is known about the long term effects, thus insuring that many years down the road our children and our children's children will not be haunted by these insidious problems which could have been prevented in the first place.

The evidence is overwhelming that the dumping of toxic dredge spoil can seriously impact the receiving ocean waters. Thus the impact is all the more magnified when the toxic dredge is dumped in waters with less flushing capacity than the Ocean. This is why Long Island Sound should not be classified as an ocean. Rather it is a semi-enclosed estuary which only benefits from a four to five percent flushing action at each tide. This is one of the reasons there was such opposition to the opening of the western Long Island Sound dump site. Western Long Island Sound is the most populated part of the Sound. It is characterized by few tributaries, irregular relief, poor circulation and water quality, greater human use than the rest of the Sound, and shallow depths. Yet, within the western basin is a major site. By looking at old disposal areas in the Long Island Sound, a limited understanding has been gained of the potential long-range cumulative effects of open water disposal. It is the chronic consequences of this practice that have yet to be adequately assessed.

Of particular concern, but as yet not clearly understood, is the mobilization of contaminants from sediments into food chains. For the present, there does not seem to be any serious effect on marine life in estuaries. In fact in the technical research paper by James Walter Morton entitled Ecological Effects of Dredging and Dredge Spoil Disposal: A Literature Review (United States Department of the Interior, Fish and Wildlife Service, Washington, D.C., 1977) it says: "In most polluted estuaries, ..., contaminants seldom occur in the surface sediments and water column at concentrations high enough to kill estuarine organisms. For instance, Butler (1967) reported: "Pesticide residues observed in monitored samples indicate concentrations of water-borne pesticides to be too small at any one time to cause detectable damage to biota." Mr. Butler then goes on to issue the following warning: "The danger in this pollution lies in the fact that persistent pesticides are concentrated, cycled and magnified in the food web. Butler observed a 1,000 fold increase in DDT residues in both plankton and oysters collected near beaches sprayed with DDT. In a paper entitled Resistance May be an Important Mechanism by which Marine Microbes Respond to Environmental Toxicants (1982, Gerard M. Capriulo, Jeffrey Flanzenbaum, Charles F. Wurster, and R. George Rowland) the proposal is made that at least certain marine microbiotic organisms respond to toxic stress by the development of resistance. The paper

Colonel Sciple
August 6, 1985
Page 6

then indicates that:

" If resistance were widespread among marine organisms in polluted environments, it would be an important consideration in evaluating long term biological impacts of pollutants. Increased resistance among estuarine plankton...may increase human exposure to toxic pollutants, since biomagnification will concentrate these chemicals in predators that include human food sources."

Today, in 1985, the long range effects of pollutants on the food chain are almost as little understood as back in 1967 when Butler wrote on the subject. But the findings of Butler, and Capriulo do seem to suggest that contaminants disturb a delicate biochemical equilibrium involving the cellular 'controls' of an individual organism or a species development.

Another Chronic consequence of open water dumping is the physical effect that it has on Long Island Sound. An alteration of circulation patterns may result when spoil mounds block and reroute tidal currents, induce shoaling, or alter flushing rates. Another important effect is the uncontrolled redistribution of sediments eroded from the spoil mound at the disposal site. During open water dumping the larger, heavier particles such as sand and clumps of mud settle rapidly out of suspension, the fine silts and clays remain suspended for longer periods and are transported from the dredge site by local currents. Unconsolidated fine sediments are also returned to the water with the overflow from hopper dredges. For example, in Coos Bay, Oregon, turbidity readings of 80 Jackson Turbidity Units (JTU) were recorded immediately before dredging and more than 400 JTU in the wake of the operating hopper dredge (Morton Page 4). Wind generated waves (are) considered to be the principle agents that erode a spoil bank. It was reported that immediately after spoil deposition in Galveston Bay, more than 40 percent of the spoil (based on original in-channel volume) had left the designated spoil area and spread out over the bay floor primarily as a mud flow. Six months after disposal, the spoil covered an area about three times the size of the original spoil area (Morton Page 6).

Information on the processes controlling the long term erosion and transport of spoils away from the disposal site is so limited that it is difficult to select suitable sites in areas where the spoil mound is least likely to be eroded.

One of the most important concerns that I have in regard to open water dumping is the effect that it might have on Long Island's drinking water. Long Island drinking wells have been continually plagued by nitrate contamination as well as other undesirable toxicinogens. Once these wells are polluted, well head treatment is an expensive remedy. Dr. William A. Muller, before the Subcommittee on Natural Resources and Environment stated: Recent evidence indicate that the flow of subterranean fresh water moves

Colonel Sciple
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Page 7

through a natural aquifer that extends from Connecticut and its watershed area under the Sound and under Long Island. Thus there is possible danger that the toxins at the dump site may leach down into the sediment, and contaminate a major source of fresh water for Long Island residents, especially on eastern Long Island."

Without a long-range overall plan, designed to protect both the waters and the inhabitants of this area, long term effects of the present policy could be dire.

It is unfortunate that the Army Corps must perform the bulk of research related to the environmental effects of open water dumping as well as other alternatives. There is very little information on this subject which was not collected by the Corps. Other unbiased research is sadly wanting.

In the letter addressed to me from John Pegors, Regional Director of the Minnesota Pollution Control Agency, he says the following:

"I have...included a copy of a 'Dear Colleague' letter circulated by an investigator who contracted with the U.S. Army Corps of Engineers Waterways Experiment Station (WES) for work on the use of dredge spoils islands by colonial seabirds in New Jersey. The basis for the 'Dear Colleague' letter was the fact that the Corp had so significantly altered both the data provided by the investigator in the preparation of a report for the Corp, that that the investigator felt her scientific credibility was being undermined by the U.S. Army Corps of Engineers at the Waterways Experiment Station."

Mr. Pegors then goes on to say:

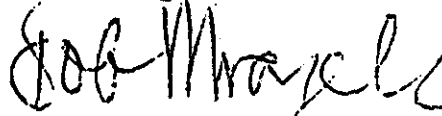
"Some of the work prepared by the Waterways Experiment Station is of questionable scientific credibility. Our Agency has had occasion to examine the reports prepared by the investigators for the Waterways Experiment Stations and find that the work is not of a quality that it can be assigned a high degree of utility by our Agency in determining whether or not water quality will be adversely affected. A major problem associated with work done with Waterways Experiment Station is the fact that very little, if any, of it is exposed to peer review. Peer review of the reports would have the virtue of providing scientific scrutiny by persons who have no direct interest in the result of the investigation under review."

Colonel Sciple
August 6, 1985
Page 8

This assessment of Mr. Pegors reinforces my concern that the Corps has not concluded a balanced review of all of the environmental considerations involved in this decision.

Thank you for reviewing these comments. I look forward to receiving your final report as well as a detailed response to the concerns I have raised.

Sincerely,

A handwritten signature in dark ink, appearing to read "Bob Mrazek", with a long horizontal flourish extending to the right.

Robert J. Mrazek
Member of Congress

RJM/smms



State of Connecticut



Department of Environmental Protection

Stanley J. Pac
Commissioner

165 Capitol Avenue

Hartford, Connecticut 06106

August 28, 1985

Joseph L. Ignazio
Chief, Planning Division
Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254

RE: Long Island Sound Studies Dredged Material Containment
Feasibility Report

Dear Mr. Ignazio:

I am writing in response to your letter of July 3, 1985, requesting State review of the Long Island Sound Studies Dredged Material Containment Feasibility Report. In accordance with Executive Order 12372 Intergovernmental Review of Federal Programs, and the "State Process" instituted by Connecticut, I am submitting the following official State comments and recommendations. These comments represent the expressed opinions of the Connecticut Departments of Environmental Protection, Health Services and Transportation, the Council on Environmental Quality and the State Historic Preservation Office.

The Feasibility Report concludes that containment of dredged materials along the Connecticut coast as islands or shoreline extensions is neither economically nor environmentally justified under present circumstances. This position is supported by the State. However, while the present costs of open water disposal are preferable to those of containment, the Feasibility Report does not directly address the longevity or remaining capacity of the four existing open water disposal sites. While that omission may in fact indicate the presumption of sufficient long-term capacity, some reference should be provided as to when in the future alternatives such as containment might require further analyses. Such information would enable completion as necessary of the additional planning studies advocated in the Report. Preparation of those studies would also be of use in the event that changing economic and environmental conditions render containment at any of the five designated study sites, or at any of the sites initially considered, more attractive.

Accordingly, some reviewers have suggested precautions which should be taken in any future consideration of containment

proposals. In several instances, those comments are specific to individual proposed sites. Opposition to disposal at the proposed Clinton Harbor site concerns the sensitivity of the coastal resources at that location. Construction of such a facility would cause negative impacts upon the ecological integrity of the recently established Hammonasset Natural Area to which it would be adjacent. It would also conflict with the existing and proposed provisions of the Coastal Barrier Resources Act of 1982 under which the surrounding beach, dune and marsh systems have been or will be federally designated as coastal barriers. Disposal activity could potentially affect both rare and endangered species and critical wildlife habitat at the Clinton site. Reviewers are also concerned that the success of such proposed wetland creation on dredged spoils has not been satisfactorily demonstrated in Connecticut.

If successful marsh creation is proven feasible, containment facilities at two other proposed sites, Penfield Reef and the east side of the channel in Milford Harbor, could provide social and economic benefits in terms of flood and erosion protection in addition to the expansion of wetland resources. However, both areas are valuable, biologically productive habitats which would require additional site-specific studies before further consideration is given to disposal. Disposal at Sherwood Hole or other borrow pits would warrant similar caution. Disposal would have to be limited to clean material, since these areas are located near public beaches and shellfish beds. It may be that "edge effects" associated with borrow pits provide diverse, productive areas.

Additionally, any studies conducted prior to designation of a containment site must include the identification and evaluation of offshore or submerged cultural resources in accordance with the National Historic Preservation Act of 1966. For future revision of Table 20 in the Feasibility Report, it should be noted that the U.S. Department of the Interior is actively pursuing acquisition of Milford Point, and it is expected that this area will become a component of the Connecticut Coastal Wildlife Refuge System.

It was observed that any solution to a problem such as dredging and dredged material disposal must be expected to have certain impacts and to engender a degree of public opposition, but that those impacts can be minimized if addressed properly. Thus in summary, State reviewers, in expressing concern over potential impacts of containment activities on living marine resources and coastal ecosystems, caution that any future consideration include careful, case-by-case analysis of all direct and indirect environmental, economic and social effects of such action.

Joseph L. Ignazio

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August 28, 1985

Thank you for the opportunity to comment on the Dredged Material Containment Feasibility Report. If you have any questions regarding these remarks, please feel free to contact Mr. Arthur J. Rocque, Jr., Director of my Office of Planning and Coordination/Coastal Management at (203) 566-3740.

Sincerely,


Stanley J. Pac

SJP/TO

cc: John Anderson
Dennis DeCarli
Fred Banach
Richard Clifford
Paul Herig
Robert Jones
Eric Smith
Hugo Thomas
Benjamin Warner
Douglas Lloyd
John Shannahan
Joseph Trantino

Division Engineer
New England Division
Army Corps of Engineers
424 Trapelo Road
Waltham, Ma. 02254-9149

July 15, 1985

Subj: Disposal of Dredging Spoils

Ref: The New London Day Article on Proposed
Containment Island at Black Ledge.

I too am opposed to the ref: containment island as it is felt it would be too costly, ugly in appearance and prone to overflow into Pine Island channel during major storms. I have lived in this area since 1929 and have watched many of the subj: operations in process.

When the Coast Guard Academy was built, a steel bulkhead was driven parallel to the shore and river mud pumped in behind it to make some much needed shore front property. A few years later when the river was being dredged in the vicinity of the Sub Base the spoils were pumped into a swampy area north of the Base which again made some very much needed and usable property.

Electric Boat was able to gain some 5 acres of land between blasting out ledge on the street side and gradually using the stone for rip rap fill along the shore line.

I mention the above because I feel the spoils should be applied to something useful if at all possible. The Groton-New London airport is in much need of a longer runway to accommodate jet aircraft. It appears that some 2000 ft. could be added to the S.W. - N.E. runway merely by installing a bulkhead and pumping the subj: spoils in behind it.

Proper placement of the bulkhead would assure the operation would only replace the shoreline that the 1938 hurricane and subsequent storms has washed away. This should also alleviate any feelings about filling in wetlands.

JUL 17 1985

Sincerely

Robert C. King

**SOUTHEASTERN CONNECTICUT
REGIONAL PLANNING AGENCY**

139 Boswell Avenue, Norwich, Connecticut
(203) 889-2324 06360-4592

16 July 1985

Division Engineer
New England Division
U.S. Army Corps of Engineers
Attention: NEDPL-BC
424 Trapelo Road
Waltham, Massachusetts 02254

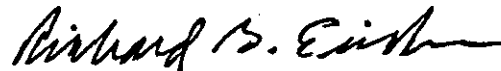
Dear Sir:

I have reviewed the draft "Long Island Sound Studies Dredged Material Containment Facilities Feasibility Report." This appears to have been a comprehensive and detailed study, the findings of which support the conclusions.

I have found only two minor errors. On page 41, Two Tree Island is incorrectly described as being off Millstone Point in Westbrook rather than Waterford. This error is repeated on page 81 and compounded by referring to the island as Town Tree Island.

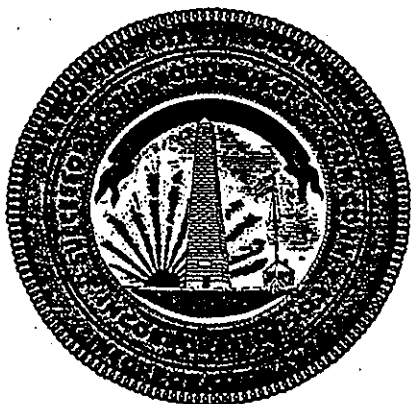
Thank you for the opportunity to review the draft.

Sincerely,



Richard B. Erickson,
Executive Director

RBE:p1



THE CITY OF GROTON CONNECTICUT

295 MERIDIAN STREET

06340

Conservation Commission

19 July 1985

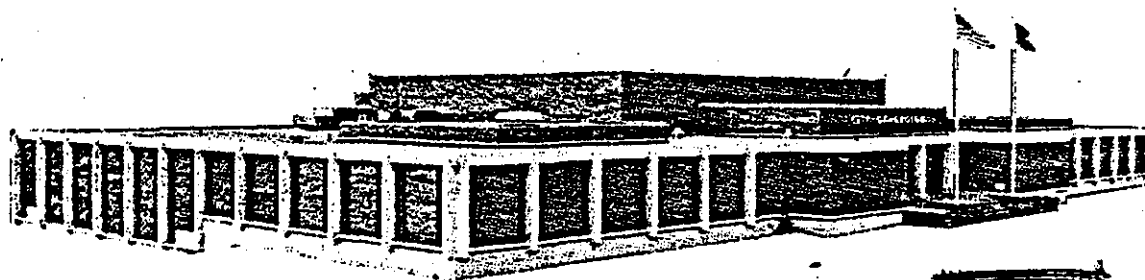
New England Division
Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254-9149

REFERENCE: Containment Island

Gentlemen:

At a regular meeting of the Conservation Commission for the City of Groton, held on 9 July 1985, it was unanimously voted to request that the Army Corps of Engineers reconsider its decision against funding for a containment system to hold dredge spoils from the eastern area of Long Island Sound and Fishers Island Sound. The reasons for our concerns of the notification published on 9 July 1985 in "The Day", New London, Connecticut, (enclosed herewith) are as follows:

- 1 - Continual (every 4-5 years) dredging of the Thames River to permit safe navigation of Nuclear powered, Ballistic and Cruise Missile carrying submarines must be maintained. As noted in the 13 April 1985 article in "The Day", New London, Connecticut, considerable quantities of dredge spoils must be dealt with. It was most fortunate that the Trident submarine SSEN Florida did not hit some of the large solid objects and steel cables which were improperly dumped at or near the New London dumping grounds, when the submarine hit the high mountain of spoils there.
- 2 - Unsupervised dropping of the spoils has caused much economical harm to the local commercial fishermen dragging in the area in terms of loss of costly equipment and time.
- 3 - Only short-term funding was provided in studying the impact of the dropping of contaminated and toxic spoils which were supposedly "capped" with clean spoils.



19 July 1985

- 4 - Were the spoils "uncapped" when the mount of spoils was flattened after the SSBN Florida ran into it? Such emergency repositioning of spoils is also very costly when done without competitive bidding.
- 5 - Are the toxic metals and PCB's getting into the food chain?
- 6 - How much of the spoils, which are held in suspension, drift back to the places of origin and cause re-dredging?
- 7 - When the economics of the above questions and comments on the possible impact to the food chain are all considered, would it be more prudent to plan now for a safer containment system?
- 8 - Funding for continuous monitoring and proper supervision of the existing dump sites in Long Island Sound should be provided and periodic reports published. Sufficient funding should also be provided to start Phase I of containment sites for all of Long Island and Fishers Island Sound's future expansion, maintenance and clean-up dredging of the harbors, marinas, rivers and coves.

Respectfully,

L. J. Chmura
L. J. Chmura
Chairman

LJC/kaf

cc: Mayor & Council
Long Island Task Force
Senators Lowell Wiecker
Dodd
Gejdenson
Tuthill
Schoolcraft

15 DMS
7
The Day, New London, Conn., Tuesday, July 9, 1985 31

Army Corps study rules out containment island

The Army Corps of Engineers has completed its study in which it decided against the funding of a \$30 million containment island at Black Ledge to hold dredged spoils.

The corps, in a prepared statement, said its findings are that such containment islands do not compete favorably with present disposal options. "Though the consideration of such sites on a case-by-case basis may be advisable, their widespread use is not being recommended," said Col. Carl B. Sciple, chief of the corps' New England division. "We also are recommending no federal participation on the construction of any containment projects."

The decision not to spend the money was made early last year by the Army. The existence of a still usable place for dredged spoils at the New London Dumping Grounds was among reasons given for the decision. Engineers for the Army Corps had been working nearly four years on a proposal to build a square, walled-in dike to hold materials dredged from the Thames River.

The island was to have been built southwest of Avery Point and northeast of New London Ledge Light.

The island would have replaced the New London Dumping Grounds which is open water northeast of Fishers Island.

"The concept of containment sites for dredged material has been used with economic and environmental acceptance in the Great Lakes, the mid-Atlantic and southeastern Atlantic regions," the corps' statement reads. "Between 1961 and 1979, 70 percent of the material dredged in Long Island Sound has been placed in open water sites and 30 percent in upland areas. Containment is considered as a possible alternative to these Long Island Sound disposal options."

Congress in 1978 asked the corps to study the feasibility of such containment facilities. After it solicits public comment on its findings, the corps will file its report with Congress. Written comments may be submitted within 30 days to the division engineer, New England Division, Army Corps of Engineers, 424 Trapelo Road, Waltham, Mass., 02254-9149.

The Day, New London, Conn., Saturday, April 13, 1985 17

River, harbor to be dredged in fall

GROTON — The Army Corps of Engineers will dredge the Thames River this fall to return New London Harbor to its 40-foot depth.

The Army Corps, based in Waltham, Mass., plans to remove 465,000 cubic yards of clay from the New London Harbor and Thames River channels, and cart it to the New London Dumping Ground in Fishers Island Sound.

"The dredging, which would extend about 2.6 miles upstream of the Interstate 95 bridge, is expected to be complete next spring," said Col. Carl B. Sciple, head of Engineers for the region.

The Army Corps will remove the silt to provide safe depths for the Navy and commercial ships.

The 40-foot deep New London Harbor channel is currently 37 feet and the the 36-foot deep Thames River channel is 32 feet.

The two channels were last dredged in 1981 to accommodate the missile-firing Trident Submarines, and the 688-class submarines.

"About 140,000 cubic yards of the total volume of material scheduled to be removed will come from concurrent dredging of the Navy's facilities in the area," Sciple said.

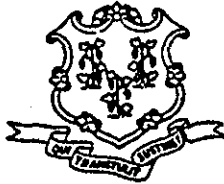
All of the dredged material will be taken to the disposal site in Fisher's Island Sound, about 2 nautical miles south of the New London Ledge Light. The dredged material will be evaluated to determine whether the silt will have an adverse effect on the environment, according to information provided by the Army Corps of Engineers.

Last year, the disposal site shifted when someone inadvertently moved a buoy marking the spot where the material can be

dumped. The material from at least half a dozen dredging projects in the Thames and Mystic rivers piled up at the site before the error was discovered when the Trident Submarine Florida bumped into a shoal caused by the dumping. The 560-foot submarines need a clearance of 40 feet of water.

Anyone may submit comments or request a public hearing. Hearing requests must be in writing and must clearly give the person's interest and why the dredging would affect that interest.

Public comments and requests for hearings must be sent no later than May 6 to Col. Carl B. Sciple, at the New England Division of the U.S. Army Corps of Engineers, 424 Trapelo Road, Waltham, Mass., 02254-9149, to the attention of the Navigation Branch.



State of Connecticut
HOUSE OF REPRESENTATIVES
STATE CAPITOL
HARTFORD, CONN. 06106

REPRESENTATIVE PHILIP H. TUTHILL
FORTIETH DISTRICT

126 BROAD STREET
GROTON, CONNECTICUT 06340

MEMBER
ENVIRONMENT COMMITTEE
FINANCE, REVENUE AND BONDING COMMITTEE

July 24, 1985

Colonel Carl B. Sciple
Division Engineer
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Colonel Sciple:

After reviewing all the information in your report on the completion of your study of dredged material containment for Long Island Sound (in particular, Black Ledge), I feel this would be beneficial, not only for the Thames River and adjacent beaches, but also for the entire Sound in South Eastern Connecticut. This form of containment facility would provide for future recreation, storm abatement and open space planted areas.

I endorse Conservation Commission Chairman Chmura's eight points in his letter of July 19 to you and whole heartedly endorse the Black Ledge concept and will be available for any type of support that may be required.

Sincerely,

A handwritten signature in cursive script, appearing to read "Phil", enclosed within a circular flourish.

Philip H. Tuthill

PHT/mfs

cc: L.J. Chmura
Hon. Catherine J. Kolnaski
New London City Manager C. Francis Driscoll
Town of Groton Town Manager C. Richard Foote



THE LONG ISLAND SOUND TASKFORCE

of The Oceanic Society

Division Engineer
New England Division
U.S. Army Corps of Engineers
Attn: NEDPL-BC
424 Trapelo Road
Waltham, MA 02254

July 26, 1985

Dear Sir/Madam,

The Long Island Sound Taskforce feels that it is a sound decision to not utilize containment facilities for the disposal of dredged materials at this time. We feel that containment facilities may be environmentally hazardous in the event of a severe storm.

However we would like to emphasize that we are in agreement with a point raised in the comments submitted by the Conservation Commission of the City of Groton regarding the bioaccumulation of toxic metals and PCB's in the food chain. We agree that long term studies need to be done to determine whether the marine life around the current dredge sites is assimilating any of the chemicals, heavy metals or toxics associated with the dredge spoils, and if they are, to what degree these toxins are entering the food web.

Another point we would like to suggest that the Corps consider over the long term regards marsh restoration: not marsh creation with dredged material but rather marsh restoration with clean sediments. Upland marshes act as a sponge absorbing water at high tide and releasing it as the tide flows out. Restoring upland marshes which have been destroyed over the years would increase the flushing capacity of rivers. Increasing the flushing capacity of rivers would reduce the rate of sedimentation at the harbors and thus decrease the need for frequent dredging. In the long term such planning would be cost effective.

Respectfully,

Bob Bachard

Bob Bachard
President

Meg Goodwin

Meg Goodwin
Program and Policy Coordinator

cc: L.J. Chmura, Chairman, Conservation Commission, City of Groton
Senator Lowell Weicker
Congressman Stewart B. McKinney

Office of the
**STATE
HISTORIC
PRESERVATION
OFFICER**
for Connecticut

59 SOUTH PROSPECT STREET • HARTFORD, CONNECTICUT 06106 • 203 566-3005

July 25, 1985

Mr. Joseph L. Ignazio
Chief, Planning Division
Department of the Army
NE Division, Corps of Engineers
424 Trapelo Road
Waltham, MA 02254

**SUBJECT: LONG ISLAND SOUND DREDGED MATERIAL MANAGEMENT
STUDY**


Dear Mr. Ignazio:

The State Historic Preservation Office has reviewed the above-named draft feasibility report prepared by the New England Division, Corps of Engineers. This office understands that the Corps of Engineers has recommended that no federal implementation of dredged material containment facilities be undertaken in the near future. Further, we understand that formal environmental reports and review procedures for site-specific dredge-disposal areas will be properly contracted as required. The State Historic Preservation Office notes that such studies must include the identification and evaluation of off-shore or submerged cultural resources in accordance with the National Historic Preservation Act of 1966.

This office appreciates the opportunity to have reviewed and commented upon the document.

For further information, please contact David A. Poirier, Archaeologist.

Sincerely,


Dawn Maddox
Deputy State Historic
Preservation Officer

DAP/PW



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION



NATURAL RESOURCES CENTER
165 Capitol Avenue, Room 553
Hartford, Connecticut 06106

July 24, 1985

.. Division Engineer
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 0224-9149

Re: Comments on Completion of Study of Dredge
Material Containment for Long Island Sound

Att: NEDPL-BC

To Whom This May Concern:

The Natural Diversity Data Base previously commented on the proposed dredge material containment site for the West side of Clinton Harbor (see attached "A"). Our major concerns continue to be: 1) Rare species of birds known nesting (several state-listed and one proposed for federal listing. 2) The fact that the salt marsh and coastal barrier beach are considered outstanding examples of habitats considered critical/threatened in Connecticut and 3) Hammonasset State Park is now officially a Natural Area Preserve (see attached "B").

The other four sites do not pose any immediate or direct threats to known locations of rare and endangered species.

From the document prepared by Corps of Engineers and dated July 3, 1985, I see you have addressed our concerns. The intent of this correspondence is to provide updated information and reiterate our concerns for the record.

If you have any additional questions, please feel free to contact me at (203) 566-3540.

Sincerely,

Nancy M. Murray
Nancy M. Murray
Biologist/Data Manager

NMM/yla

Enclosures

Phone: (203) 566-3540

U.S. Corps of Engineers, Hartford District

100 South Main Street, Hartford, CT 06106

"A"

TO: Christine Suarez-Murias
DEP, Planning

FROM: Nancy Murray
DEP-NRC, Connecticut Natural Diversity Data Base

RE: Proposed Clinton Harbor Containment Facility

Date: 28 March 1984

In response to your request for information regarding critical biologic resources in the Clinton Harbor-Hammonasset State Park area, the following information is provided from the files within the Connecticut Natural Diversity Data Base and Natural Areas Inventory. Because of the presence of a significant ^{concentration} of critical natural resources in this area, I hope special consideration will be directed toward this issue.

In 1975 Hammonasset State Park was designated as a Natural Area Preserve by an administrative directive. Presently, the ad hoc Natural Area Preserve Advisory Committee is recommending it receive full designation as a Natural Area Preserve. The reasons this area is so recommended are the same reasons for concern that the ecological integrity of the site be upheld.

Hammonasset State Park is made up of several habitats classified as critical habitats by Dowhan and Craig's 1976 publication "Rare and Endangered Species of Connecticut and Their Habitats" (Report of Investigation #6). Hammonasset State Park is considered to be one of the most extensive tracts of salt marsh remaining in Connecticut. Typical of salt marshes, Hammonasset provides a tremendous array of organisms with food, shelter and breeding sites.

Salt marshes are considered among the most productive ecosystems in the world. On a cursory biologic inventory (Craig, 1975) a minimum of 26 avian species, 9 mammals, 7 crustaceans and 14 gastropods were observed using the marsh area. Fish also use this area as feeding, breeding and nursery grounds. Their presence, no doubt, provides a significant food source for many organisms (including man).

Other significant habitats include the dune community, open sandy beach areas and coastal forest. These critical habitats, including the salt marsh provide refuge and breeding sites for a number of Connecticut's rare and endangered species. Survival of such rare species populations, again, depends on the existence and quality of these habitat types. Such complex inter-relations strike a balance and require protection as well as preservation.

If you have any questions please feel free to contact me. Thank-you for your request.

"B"

HAMMONASSET PRESERVE DESIGNATED



In a brief ceremony in Madison, Governor William A. O'Neill officially designated sections of Hammonasset Beach State Park in Madison and Clinton as the Hammonasset Natural Area Preserve on May 22. This event marked a conservation milestone as the first natural area given the protection of state law since 1972 and the first ever on the Connecticut shoreline.

With its new status, the 402 acre preserve will be maintained in a natural state and managed for educational and scientific purposes. The area includes the salt marsh in the eastern part of the park, a strip of upland habitat with unusual coastal thicket vegetation, and a narrow stretch of beach bordering the eastern edge of the marsh. Although the public may still visit the marsh, such activities as draining, filling, or removing natural vegetation are prohibited. The preserve does not include the bathing beaches, the popular fishing area at Meigs Point, or the campgrounds, so it will not affect the recreational use of the park.

Governor O'Neill noted that statewide support for this preserve had come from conservation organizations and individuals all around the state and that the Hammonasset salt marsh is one of the largest and best preserved marine wetlands left in Connecticut.

Salt marshes are critical habitat in the life cycle of many estuarine and marine animals. In Connecticut more than 50 percent of the original salt marsh habitat has been destroyed. The opportunity to preserve this large segment of remaining marsh is, therefore, particularly important.

The Preserve harbors several rare bird species, including least terns and piping plovers. It is an outstanding area for watching migrating birds, especially hawks and waterfowl, and it is a major wintering area for owls. The marsh is already heavily used for environmental education, one of the primary purposes of Natural Area Preserves.

Hammonasset Marsh will be the sixth Connecticut Natural Area Preserve. Other areas are located on Canaan Mountain in northwestern Connecticut and on four small forest research plots in the eastern part of the state. Hammonasset Marsh is the first Natural Area Preserve on the coast.

The Connecticut Natural Area Preserves program is administered by the Department of Environmental Protection. An Advisory Committee, appointed by Commissioner Stanley J. Puc, is evaluating several hundred sites suggested for Natural Area designation. A statutory requirement that a Preserve be

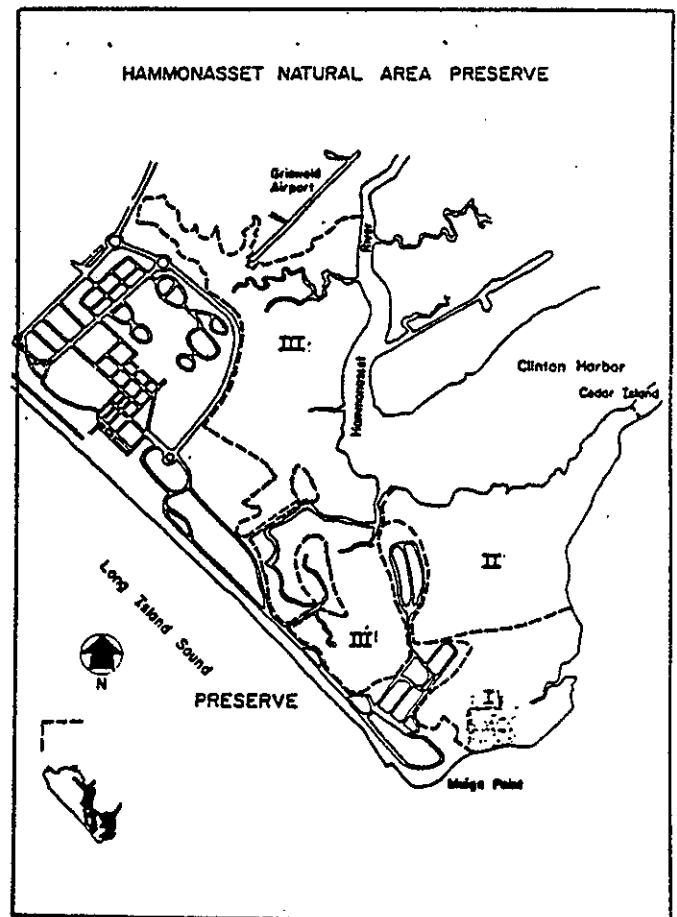
of exceptional value for scientific or educational purposes is applied to a wide variety of areas. Endangered species habitats, unique plant communities, and fossil beds are some of the categories under consideration. A further requirement that an area be owned or controlled by the state has curtailed expansion of the Preserve system which now contains a total of about 2400 acres.

"Natural diversity is a key element in the quality of living in Connecticut," said Governor O'Neill, "and it is important that unique areas be protected for future generations to study and enjoy. Designation of Hammonasset Marsh is the culmination of years of work by many people and is indicative of a renewed Natural Area Preserves program."

Governor O'Neill presented a proclamation, officially designating the Hammonasset Natural Area Preserve, to Deputy Commissioner Dennis DeCarli of the Department of Environmental Protection, the agency charged with administering the Natural Area Preserves program.

Accepting the proclamation, DeCarli expressed the department's thanks to the members of the Advisory Committee for the hard work and dedication that led to the event. He also expressed the hope that many more such areas will be designated in the near future.

Speaking for the Natural Area Preserves Advisory Committee, Karl Wagener, now Executive Director of the Connecticut Council on Environmental Quality expressed the committee's satisfaction at seeing this result of their efforts.



From Connecticut Woodlands
Spring 1985

CHRISTOPHER PERCY
41 New Shore Road
Waterford, CT. 06385

August 14, 1985

Colonel Carl B. Sciple
Division Engineer
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02254

RE: Dredged material containment,
LIS Study, Feasibility Report,
June, 1985

Dear Colonel Sciple:

I recently reviewed the above report and would like to draw your attention to page 41, number 15, Two Tree Island.

I am the owner of record of Two Tree Island and wish to point out that the Island is in the Town of Waterford, CT and not Westbrook, CT, as referenced.

Aside from that oversight, I will not relinquish title to Two Tree Island for any purpose related to its development including as a dredged material disposal site.

Two Tree Island is a natural waterfowl refuge year round, and importantly during waterfowl migrations. Species such as Ruddy Turnstones are known to nest on the island. The waters surrounding Two Tree Island provide a substantial sport and food fishery for recreational anglers; provide excellent lobster habitat; and several large tracts nearby have been leased by the State of Connecticut to shellfishermen for shellfish depuration.

Please be advised of my ownership, concern, and strong intention to protect and preserve Two Tree Island in Waterford, CT.

Sincerely yours,



Christopher Percy

cc. Francis Pavetti, Esq.

AUG 16 1985

SOUTH WESTERN REGIONAL PLANNING AGENCY
DARIEN GREENWICH NEW CANAAN NORWALK STAMFORD WESTON WESTPORT WILTON
213 LIBERTY SQ., EAST NORWALK, CONNECTICUT 06855-1029 866-5543

July 30, 1985

Mr. Joseph L. Ignazio
Chief, Planning Division
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, MA 02254

Re: Long Island Sound Dredged Material
Containment Study

Dear Mr. Ignazio:

Thank you for sending us a copy of the above referenced report.


We note with interest that some consideration was given to a site off Sherwood Island in Westport.

For the record, we wish to express concern about possible adverse effects of such an operation on the Sherwood State Park Beach, and Westport town beaches at Burying Hill, Compo and Cockenoe Island, as well as Calf Pasture Beach further to the west in Norwalk.

We are sure you are also aware of the extensive shellfish beds in the vicinity to the west of this site.

At this time, we should also like to request an extension of 30 additional days from August 1 to September 1, 1985 to allow for further local comment.

Very truly yours,



Richard C. Carpenter
Executive Director

cc: Gouvernour Nichols, Chairman Referrals Committee
William Seiden, First Selectman - Westport
Westport Agency Representatives

RCC/jcr

AN EQUAL OPPORTUNITY EMPLOYER



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

7/13/85

Mr. Joseph Ignazio
Chief, Planning Division
Department of the Army
New England Division Corps of Engineers
424 Tarpelo Road
Waltham, Massachusetts 02254

Dear Mr. Ignazio:

The U.S. Environmental Protection Agency Region II (EPA) has reviewed the draft feasibility report for the Long Island Sound Dredged Material Containment Study. Although your letter requested that all written comments be forwarded to your office within thirty days of the date of your letter (July 3, 1985), a mail delay prevented my branch from receiving your letter until the last week of July. Consequently, we apologize for submitting comments after your deadline, but trust that you will consider our comments in formulating Long Island Sound dredged material management strategies.

We have reviewed your methodologies for projected dredging activities, characteristics of material dredged, and detailed analyses of prototype sites. We basically concur with your methodologies for assessing economic, environmental, and social impacts. Our only comment regarding impact assessment would be that the environmental analysis for Milford Harbor was deficient in that it did not address finfish resources, biological resource value, or significant resources. In addition, an economic assessment was not performed for the Sherwood aqueous borrow pit; considering that by your analysis this alternative would result in minimal environmental disturbances to an area which is not ecologically significant, we consider an economic assessment vital in order to properly evaluate the feasibility of this alternative. According to your analysis, the borrow hole is 1000 feet offshore Sherwood Island State Park adjacent to the Westport/Saugatuck River area which it would serve. Because of its proximity to its service area, the lack of any new facilities to be constructed, and the absence of any specialized dredged material handling equipment, disposal at this site should be economically comparable or favorable to open water disposal. Your analysis states that the only additional expenditure associated with this alternative would be the ultimate coarse sand cap when the pit is filled to capacity. This expenditure would probably be offset by the savings associated with reduced transportation distance to the borrow hole. The Sherwood borrow pit is a viable alternative, and the EPA disagrees with your conclusion that this containment option is not acceptable.

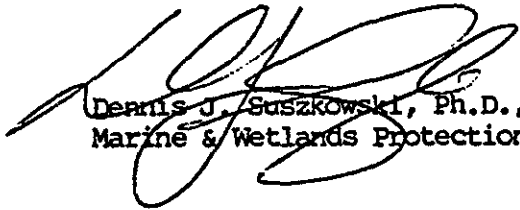
Although the EPA concurs with your procedures for evaluating potential containment sites, we do not concur with the conclusions drawn or the recommendations formulated for some of the sites. As previously stated, the Sherwood borrow pit would result in positive environmental and social impacts, would be economically competitive, and was suggested and endorsed by the State of Connecticut; yet, your recommendation dismissed this site as a viable alternative. The Clinton Harbor marsh site was similarly dismissed from future consideration even though the project is economically competitive, would produce minimal environmental impacts in an area with low shellfish and finfish populations, and has a high potential for biological enhancement. The project has strong support from the Town of Clinton and private marinas, but is opposed by the Town of Madison Shellfish Commission. Your report concludes that "the outlook for the project remains dim because of conflicts with federal barrier beach legislation, aquaculture plans, and the State designated natural area at Hammonasset State Park." With the exception of this one sentence, none of these three parameters which serve as the basis of dismissal of this alternative were addressed. Unless a clarification is provided, it must be concluded that Clinton Harbor is a viable alternative.

We concur with your recommendation that the Black Ledge, Penfield Reef, and Milford Harbor sites should be dismissed from consideration as potential containment facilities for the disposal of dredged material. The Black Ledge site has a high biological resource value with extensive blue mussel beds and commercial and recreational fisheries; annual operating costs would be approximately four times existing open water disposal costs. The Penfield reef site is similarly not cost effective and would impact an area with large populations of shellfish and finfish. Although a complete environmental analysis was not performed for the Milford Harbor site, a preliminary analysis indicated a high species diversity and abundance. Disposal costs would be one and one-half times existing ocean disposal costs, and negative social impacts would probably be experienced on adjacent beaches and the nearby residential neighborhood. Based on these factors, we concur that these sites are not feasible alternatives.

In summary, we disagree with your finding that all of the containment sites studied should be dismissed from further consideration because they are generally not cost effective, environmentally acceptable, carry widespread local support, or socially acceptable. According to the report, none of these four conditions apply to the Clinton Harbor and Sherwood borrow pit sites. Unless there is additional information not presented in the report, we cannot support your recommendation that these two alternatives are not viable.

Should you have any questions, please feel free to contact the undersigned or Ms. Janice Rollwagen at (212) 264-5170.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Dennis J. Suszkowski". The signature is stylized with large, sweeping loops and is positioned above the printed name.

Dennis J. Suszkowski, Ph.D., Chief
Marine & Wetlands Protection Branch



U.S. Department of Housing and Urban Development
Boston Regional Office, Region I
Bulfinch Building, 15 New Chardon Street
Boston, Massachusetts 02114-2598

JUL 16 6 1985

Carl B. Sciple
Colonel, Corps of Engineers
Division Engineer
U.S. Corps of Engineers
Attn: NEDPL-BC
424 Trapelo Road
Waltham, MA 02254

Dear Colonel Sciple:

SUBJECT: Draft Feasibility Report
Long Island Sound Dredged
Material Containment Study

We have reviewed the subject report and accompanying public announcement. Considering HUD's interests in housing and community development and the conclusions reached in the report citing a lack of feasibility of containment on an Long Island Sound-wide basis, we have no comments to offer.

Sincerely,

A handwritten signature in dark ink, reading "Sheldon Gilbert", is positioned above the typed name.

Sheldon Gilbert
Regional Environmental Officer
Office of Community Planning
& Development



United States Department of the Interior

FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
P.O. BOX 1518
CONCORD, NEW HAMPSHIRE 03301

MAY 23 1985

Colonel Carl B. Sciple
Division Engineer
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02254

Dear Colonel Sciple:

This is our Fish and Wildlife Report on the Long Island Sound Dredged Material Containment Study, Connecticut and New York. It has been prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

Your draft Feasibility Report indicates that over 300 potential containment sites were identified in the New York and Connecticut waters of Long Island Sound. Screening for technical and economic feasibility, environmental impacts and public acceptance severely reduced the number of sites and only five were identified for detailed investigation as prototype sites. The five sites, all in Connecticut, include: Black Ledge, Penfield Reef, Clinton Harbor, Milford Harbor, and Sherwood Island Borrow Hole. The findings of these detailed investigations are presented in the draft Feasibility Report.

The Black Ledge containment facility would store about 7.5 million cubic yards of dredged material and would create a 125 acre offshore island. Diking for the project would cost an estimated \$40 million. The proposed facility would directly affect 150 acres of productive benthic habitat supporting a diversity of species and dense concentrations of blue mussels. Your study finds that the adverse environmental impacts and unfavorable economics currently make this site infeasible. We do not support development of a containment facility at this site for environmental reasons.

The Penfield Reef containment facility would be a shoreline extension project capable of storing about 4 million cubic yards of dredged material. Diking for the project would cost an estimated \$8.6 million. The proposed facility would eliminate about 300 acres of productive bottom habitat supporting a dense and diverse benthic community. Your study finds that the project is not economically feasible and would result in negative environmental impacts. We regard potential environmental impacts as severe and do not support development of a containment facility at this site.

The Clinton Harbor containment proposal, a marsh creation project, could store up to one million cubic yards of dredged material and would expand the existing Hammonasset wetland areas. Your study finds that this containment facility is economically feasible and has high potential for biological

enhancement. However, the proposed facility abuts Hammonasset State Park and a portion of the Cedar Island spit which has been designated as a barrier beach under the Coastal Barrier Resources Act of 1982. The provisions of this legislation which restricts Federal participation and limits development activity in general would have to be addressed prior to further consideration of a containment facility at this site. We concur with your study findings.

The Milford Harbor containment facility was sited on the east side of the entrance channel as a shoreline extension project capable of storing about 270,000 cubic yards of dredged material. Your study finds that, based on sampling at nearby areas, this area is not particularly productive and major environmental impacts would not be expected. We believe that this containment facility could be developed as a marsh creation project but that additional site specific studies would be required in order to determine if environmental impacts are acceptable.

The Sherwood Island Borrow Hole is a large aqueous borrow pit that could hold/contain about 750,000 cubic yards of dredged material. Your study finds that the isolated nature of this area has generally resulted in an anoxic environment which supports a relatively low number of organisms. If the pit was filled and suitably capped the resulting environment would closely resemble that of the surrounding area which supports extensive hard clam and oyster beds. Use as a disposal area is a worthwhile consideration in the future. We are in general agreement with your study findings, however, we believe this area should be proposed for a site specific study.

Your draft Feasibility Report does not propose implementation of any project. The report concludes that under present conditions containment is not a feasible alternative and that critical factors including economics, environmental and public inputs rule out widespread reliance on containment for the disposal of dredged material in Long Island Sound. Although the study was able to identify potential sites for containment facility projects, current dredging and disposal operations are favored over containment alternatives not only on an economic and sometimes environmental basis but more specifically on cost sharing arrangements. Therefore, you have recommended no Federal interest at this time in the implementation of containment facilities for the disposal of dredged material in Long Island Sound.

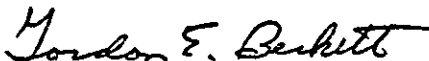
We disagree with the conclusions of your feasibility study regarding containment of contaminated dredge material and beneficial uses of clean material in Long Island Sound. In our opinion, the practicality of utilizing confined disposal sites has been adequately demonstrated in the Great Lakes since the late 1950's. The major difference between study conditions in Long Island Sound and the Great Lakes is that people utilize the Great Lakes as a

source of drinking water and therefore are much more concerned about waste disposal practices in that system. We believe that Long Island Sound and the remainder of our coastal waters deserve the same level of protection as the Great Lakes since they are of major importance as food producing areas, have high ecological values including spawning and nursery areas for nearly all of our marine vertebrate and invertebrate species, provide migration pathways for fish and wildlife and contribute immense recreational and aesthetic values to man.

One of the major basic faults with the Long Island Sound study is the economic analysis which basically compares the existing open water disposal practice against confined and/or beneficial dredge material disposal practices. We believe a more appropriate economic analysis would be to compare alternative confined disposal sites against each other in a fashion similar to that done under P.L. 91-611 for the Great Lakes. The present analysis is deemed inappropriate in that it is skewed in favor of open water disposal since the appropriate monetary values have not or cannot be accurately predicted for the true environmental and societal costs for open water disposal of contaminated materials.

We are confident that many environmentally acceptable sites for confined disposal facilities exist in Long Island Sound. The proper conclusion of your feasibility study would be to actively pursue site specific studies for containment facilities within reasonable distances from the major commercial harbors in the Sound and elsewhere along the New England coast.

Sincerely yours,



Gordon E. Beckett
Supervisor
New England Area

CC: RO/HR Reading File
CT DEP, Marine Div. (Bob Sampson)
CT Dept. of Agriculture, Aquaculture Div (John Volk)
NMFS, Mike Ludwig
WO/ES/FP
ES: FBenson:VLang:jd:5-22-85:834-4797

U.S. Department
of Transportation

United States
Coast Guard



Commander (dpl)
Third CG District

Governors Island
New York, NY 10004
(212) 668-6341

16475.2/6-85
30 Sep 85

Mr. Joseph L. Ignazio
Chief, Planning Division
Division Engineer
New England Division
U. S. Army Corps of Engineers
ATTN: NEDPL - 8C
424 Trapelo Road
Waltham, MA 02254

RE: Long Island Sound Studies, Dredged Material Containment Facilities,
Feasibility Report

Dear Mr. Ignazio:

The Third Coast Guard District has completed its review of the above referenced document and has determined that this project will have no impact upon Coast Guard activities.

The opportunity to comment is appreciated.

Sincerely,

A handwritten signature in cursive script that reads "Lewis D. Wunderlich".

Lewis D. Wunderlich
Third Coast Guard District
Environmental Protection Specialist
By direction of the commander

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-0001



Henry G. Williams
Commissioner

October 9, 1985

Colonel Carl B. Sciple
Department of the Army
New England Division
Corps of Engineers
424 Trapelo Road
Waltham, MA 02254

Attention: Mr. Dennis Waskiewicz

Dear Colonel Sciple:

RE: Long Island Sound Studies Feasibility Report
Dredged Material Containment, June 1985

The Department of Environmental Conservation has reviewed the above-referenced feasibility report. The report describes both the dredging and disposal needs necessary to maintain unimpeded access to port facilities on Long Island Sound in the States of Connecticut and New York.

Currently, upland disposal of dredged material is often selected as a preferred alternative when regulations governing ocean disposal or disposal in Long Island Sound prohibit disposal in these environments. At this time, environmental regulation appears to give a greater degree of protection to the ocean and the Sound than to upland resources. We recommend that in instances when upland disposal is considered as a disposal option, it be given the same degree of scrutiny and protection when considering the potential for adverse impact as is given to the ocean and the Sound.

Thank you for the opportunity for review and request the same opportunity when the final document becomes available.

Sincerely,

Louis M. Condra, Jr., Director
Division of Regulatory Affairs

cc: Mr. Langdon Marsh
Mr. Arthur Newell
Mr. Robert Greene
Ms. Barbara Rinaldi
Mr. Ralph Manna